

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Economics (FEM)**



**Master's Thesis**

**Evaluation of the development of wheat production in  
Russia**

**Semishkina Kristina**

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# CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

## DIPLOMA THESIS ASSIGNMENT

Bc. Kristina Semishkina, MBA

World Economy

Thesis title

**Evaluation of the development of wheat production in Russia**

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### **Objectives of thesis**

The main objective of the thesis is to evaluate the development of the wheat market in Russia in the period 1990-2021 and to determine the factors that cause changes in the production and price of grain on this market.

### **Methodology**

The analysis will be carried out based on fundamental knowledge of economic theory. The first part is processed with the help of descriptive methods and the method of literary research. The second part of the work initially present an overview of the grain market in the world and in Russia. Furthermore, it will be focused on fulfilment of the main goal of the thesis through the method of analysis of the development of the wheat market in Russia in the period 1990-2021. The goal of the thesis will be fulfilled through the analysis of the time series of selected indicators, carried out in the practical part of the thesis.

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**The proposed extent of the thesis**

70 – 90 pages

**Keywords**

Wheat commodity, Russian agriculture market, economic development, world grain export, production

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**Recommended information sources**

- EROKHIN, Vasily, et al. Russian trade in agricultural products: Current state and influences of trade integration. In: Transition to Agricultural Market Economies: The Future of Kazakhstan, Russia and Ukraine. CABI, 2015. p. 164-171.
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**Expected date of thesis defence**

2022/23 WS – FEM

**The Diploma Thesis Supervisor**

Ing. Pavel Kotyza, Ph.D.

**Supervising department**

Department of Economics

Electronic approval: 26. 2. 2022

**prof. Ing. Miroslav Svatoš, CSc.**

Head of department

Electronic approval: 28. 2. 2022

**doc. Ing. Tomáš Šubrt, Ph.D.**

Dean

Prague on 30. 11. 2022

### **Declaration**

I declare that I have worked on my master's thesis titled "Evaluation of the development of wheat production in Russia" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 30.11.2022

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### **Acknowledgement**

I would like to thank my supervisor Ing. Pavel Kotyza, Ph.D. and Bc. Alexander Grib, MBA. for supporting.

# **Evaluation of the development of wheat production in Russia**

Wheat is an important commodity that provides the population with food products. Russia occupies a significant position in the world wheat production market and is a leader among exporters of this commodity. The main objective of the thesis is to evaluate the development of the wheat market in Russia in the period 1990-2021 and to determine the factors that cause changes in the production and price of grain on this market. The first part of the thesis is processed by the method of literary research. The second part of the thesis contains an analysis of the time series of selected indicators, mainly from the Rosstat database, which enable the main objectives of the thesis to be fulfilled (e.g. crops area, gross harvest, productivity of land etc.). In this part, the resource base and potential of the country's agricultural sector, the importance of the wheat commodity for Russia's foreign trade and Russia's self-sufficiency in wheat are evaluated. The work outlines, that Russia's position on the world wheat market has improved significantly in the last years of the monitored period, mainly due to the growing wheat production, increasing productivity of the harvest area and growth in world prices of the commodity. The focus on supporting self-sufficiency in the domestic market is an important factor that will probably influence the future development of the Russian wheat market.

Key words: agriculture, analysis, crop area, grain, market, production, Russia, trade, wheat.

## **Hodnocení vývoje produkce pšenice v Rusku**

Pšenice je důležitá komodita, která zásobuje obyvatelstvo potravinářskými produkty. Rusko zaujímá významné postavení na světovém trhu produkce pšenice a je lídrem mezi exportéry této komodity. Hlavním cílem práce je zhodnotit vývoj trhu s pšenicí v Rusku v období 1990-2021 a určit faktory, které způsobují změny v produkci a ceně obilí na tomto trhu. První část práce je zpracována metodou literární rešerše. Druhá část práce obsahuje analýzu časových řad vybraných ukazatelů především z databáze Rosstat, které umožňují naplnění hlavních cílů práce (např. osevní plocha, hrubá sklizeň, produktivita půdy atd.). V této části je hodnocena surovinová základna a potenciál zemědělského sektoru země, význam komodity pšenice pro zahraniční obchod Ruska a soběstačnost Ruska v pšenici. Výsledky práce naznačují, že postavení Ruska na světovém trhu s pšenicí se v posledních letech sledovaného období výrazně zlepšilo, a to především díky rostoucí produkci pšenice, zvyšující se produktivitě sklizňové plochy a růstu světových cen této komodity. Zaměření na podporu soběstačnosti na domácím trhu je důležitým faktorem, který pravděpodobně ovlivní budoucí vývoj ruského trhu s pšenicí.

Klíčová slova: analýza, obchod, obilí, osevní plocha, produkce, pšenice, Rusko, trh, zemědělství.

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# **1. Introduction**

The most important branch of the national economy, on which the existence of human society depends, is agriculture, and in particular grain farming. It produces food for the population and raw materials for the processing industry, provides for other needs of society. Wheat is one of the main types of grain and a fundamental food product.

Russia belongs to the top largest wheat producers in the world and is the leader among wheat exporters. The position of this country can significantly affect the global food crisis, especially in countries that depend on foreign supplies of wheat. The choice of this country for analysis in the thesis is justified by this factor.

However, Russia is currently affected by rather contradictory factors. On the one hand, Russia is the largest grain exporting power, and today world prices are rising. On the other hand, the majority of the population does not have the opportunity to buy products at high prices, and the state regulates the prices of bakery products. The championship of Russia among world wheat exporters will probably be lost, as the country puts the internal task of ensuring national food security in the first place. At the same time, it will threaten the availability of Russian wheat for foreign partners.

In connection with the expected decline in world wheat production, which will not be enough to meet the expected consumption (43), the chosen topic of the thesis becomes particularly relevant. Representatives of the UN Security Council during the spring months of 2022 made statements about a possible period of extremely food scarce due to a shortage of grain and flour in several countries (Africa, Asia, Latin America). Nevertheless, experts today come to the conclusion that there are more than enough grain reserves in the world, but due to the military operation in Ukraine, relevant international restrictions and sanctions, problems with logistics, grain will be delivered to the consumer with great difficulty (42).

Due to the high importance of wheat as a commodity on the Russian and world markets, the chosen topic of the work is very important. Monitoring the trend in wheat production and trade will allow early detection of risks and problems that may reduce the countrys' self-sufficiency in this vital cereal.

## **2. Objectives and Methodology**

The thesis focuses on the analysis of the development of wheat production in Russia.

### **1.1 Objectives**

The main objective of the thesis is to evaluate the development of the wheat market in Russia in the period 1990-2021 and to determine the factors that cause changes in the production and price of grain on this market. The sub-objectives of the work are:

- assess the resource base and potential of the country's agricultural sector,
- describe the geographical structure of wheat production in Russia,
- evaluate the importance of the wheat commodity for Russia's foreign trade,
- assess Russia's self-sufficiency in wheat.

### **1.2 Methodology**

The thesis is divided into three main parts. The first part is processed with the help of descriptive methods and the method of literary research. The aim of this part is to outline the history of wheat cultivation and trade of this commodity, to define wheat types and the specifics of its cultivation and storage.

The second part of the work initially present an overview of the grain market in the world and in Russia. Furthermore, it will be focused on fulfilment of the main goal of the thesis through the method of analysis of the development of the wheat market in Russia in the period 1990-2021. Due to the complex political situation and the absence of reliable statistical data, the period of 2022 is not included. Research questions are:

1. What factors determine the development of the wheat market in Russia?
2. How has the productivity of land in Russia changed?
3. How self-sufficient is Russia in terms of wheat supply?
4. What is the position of Russia on the world wheat market?
5. What are the prospects for the future development of the wheat market in Russia?

Finding the answer to these questions makes it possible to define the factors that shape the current market situation and are likely to shape it in the future.

The goal of the thesis will be fulfilled through the analysis of the time series of selected indicators, carried out in the practical part of the thesis. The selected indicators are:

- crops area (ha) – total square, changes, sowing areas of wheat and other crops. The purpose of the observation of this indicator is to assess the resource base and potential of the country's agricultural sector, as well as structural changes in agriculture,
- gross harvest (tons) – total, changes, gross harvest of wheat and other selected crops,
- geographical structure of wheat harvest – the share of the top regions in the total volume of gross what harvest (%),
- productivity of land (centners of wheat per hectare) – total and productivity by region. The analysis of this indicator and its comparison with other indicators (sown areas and gross harvest) allow to largely exclude the influence of natural and climatic factors and determine the contribution of the use of advanced technologies to changes in wheat yields,
- wheat reserves (tons) in agricultural organizations in Russia and in different regions, by months,
- prices of wheat (rub/ton) – total prices in Russia, prices by region,
- export and import – volume (tons), changes, total and by region, main trade partners,
- balance of the Russian wheat market (tons)
- level of the self-sufficiency of Russia in wheat (%).

The level of self-sufficiency is calculated in this thesis as a share of wheat harvest in consumption in Russia in the selected year:

$$\text{Self - sufficiency ratio} = \frac{\text{wheat harvest (mln. tons)}_t}{\text{wheat consumption (mln. tons)}_t} \times 100 \%$$

Observed period is: 1990-2021. Some indicators for which data are not available are monitored since later years. We do not analyze period after the end of 2021 due to the difficult political situation in the country.

The main data sources are Rosstat (Russian Statistical Office), Fedstat (Unified Interdepartmental Information and Statistical System), FAO (Food and Agriculture Organization of the United Nations)

The third part of the work presents a summary of the results of the performed analysis and a discussion of the results.

### **3. Literature Review**

#### **3.1 Historical origin and spending of wheat**

Wheat is one of the most ancient cultivated plants. Currently, of all agricultural crops, the largest sown area on the planet is occupied by wheat (about 215 million hectares). Types of cultivated wheat, according to scientists, from three wild cereals growing in Asia Minor, Europe and Northern Europe. There are many transformations and assumptions about the history of the origin and revival of wheat. (1, p.20)

Wheat was one of the first domesticated cereals, it was cultivated at the very beginning of one Neolithic revolution. It is safe to say that the high value of people can be beneficial for wild wheat, but a feature of wild wheat is the fact that the grains immediately fall off after cultivation and cannot be harvested. For this accidental reason, people ate unripe grains. On the contrary, grains of cultivated wheat are kept in the ear until they are knocked out during threshing. An analysis of early spikelet's discovered by archaeologists shows that between 10,200 and 6,500 years ago, wheat was gradually domesticated - gradually increasing the percentage of grains carrying the gene that gives sudden shedding. (16, p.48)

As can be seen, the domestication process takes very frequent time and proceeds to special cases, occurring often under the appearance of random tastes, and there was no attachment to the sample. The researchers drew attention to the fact that the selection of the first species was manifested by the strength of the colossus, which must withstand the harvest, by the resistance to lodging and by the size of consumption. This almost certainly resulted in the loss of human cultural ability to reproduce without human assistance, as its ability to distribute grain in the wild was severely limited. (2, p.12)

Researchers distinguish three areas in the northern Levant where the appearance of cultivated wheat is most likely: the proximity of the settlements of Jericho, Iraq ed-Dubb and Tel Aswad, and somewhat later in southeastern Turkey. (1, p.23)

It is believed that he began to cultivate it at the beginning of the Neolithic, the later Stone Age. According to genetic and archaeological research, cultivated wheat comes from regions of southwestern Asia. The most likely areas of origin for cultivated wheat are located in southeastern Turkey and the northern Levant. The time of its appearance is dated by

researchers approximately 10-8 millennia BC. In the 7th millennium BC. cultivated wheat appears in the territories of modern Northern Greece and Macedonia, in the 6th millennium BC. - Middle Egypt, India, Bulgaria and Hungary, in the 5th millennium BC. - Ethiopia, the Iberian Peninsula and the British Isles. Around the 3rd millennium BC. wheat is being cultivated in China. The tribes of Trypillian culture, who lived mainly on the Right Bank of Ukraine, began to grow wheat about 5 thousand years ago. By the beginning of our era, cultivated wheat had spread throughout almost the entire territory of Asia and Africa. In the era of the Roman conquests, it began to be cultivated in various regions of Europe. In the 16th-17th centuries, European colonists brought wheat to South and then to North America, and at the turn of the 18th-19th centuries - to Canada and Australia. (4, p.1832)

In Europe, as you move northward, wheat has had to adapt to cooler temperatures. There was no Kievan Rus yet, but the cultural cultivation of wheat already existed. In Russia, the traditional use of wheat was in the manufacture of bread, cereal porridge and jelly (kisel). From ancient times until the 19th century, in many countries, including Russia, spelt was grown mainly - a drought-resistant, but low-yielding type of wheat with a brittle spike and filmy grain. (3, p.161)

In order to obtain a higher wheat yield, farmers selected the first cultivated varieties (einkorn and two-grain) by simply selecting the best plant specimens according to such traits as ear strength, growing season, plant resistance to lodging and, of course, grain size. Such a selection was carried out everywhere for many centuries. As a result, in Russia already in the 18th century, such stable varieties of folk selection appeared in crops, such as soft spring varieties - Poltavka, Garnovka, Ulka, Rusak; winter crops - Banatka, Krymka, Belokoloska, Sandomirk; solid - Beloturka, Kubanka, Arnautka, Chernouska. In a consequence, they served as the starting material for the breeding of some domestic breeding varieties of wheat. Spelt and einkorn - these two ancient types of cultivated wheat - have valuable biological qualities: high drought resistance, lodging and precocity. They are not affected by such diseases as, for example, rust and smut, and are also resistant to some pests. At present, many types and varieties of spelt and einkorn are preserved in the collections of the Federal Research Center All-Russian Institute of Plant Genetic Resources named after N.I. Vavilov (VIR), as well as in the nurseries of breeding centers and experimental stations in Russia and abroad. Crossing modern varieties with these ancient types of wheat allows breeders to develop new hybrid varieties that retain the beneficial properties of the "savages". (3, p.167)

### **3.2 Types, varieties and features of growing**

Only three types of wheat have of significant economic importance - summer, soft or ordinary, wheat durum wheat and densely spiked, or dwarf wheat. The first of these is the common baking wheat grown all over the world. The grain of the second is used for the production of pasta, since it is rich in gluten - a mixture of proteins that form a sticky mass that not only binds the dough, but also retains carbon dioxide bubbles in it; the dough "rises" and the bread becomes fluffy. Dwarf wheat is mainly used to obtain crumbly pastries. Of less importance are spelled, emmer, spelt or two-grain wheat, Polish and English wheat. The most common subspecies of wheat are soft varieties of this crop. In Latin they are called *Triticum Vulgare*. To determine whether a particular plant belongs to this species, you need to study the structure of the ear. It is slightly loose, the scales do not have a keel, so the grains are only partially closed. Soft wheat varieties are determined based on the presence or absence of an awn: some do not have it, others do. At the same time, all varieties that have an awn (if we talk about soft wheat) have a versatile lateral direction on the spikelets. (6, p.1241)

Already by the appearance of the wheat growing in the fields, it is possible, without special research, to determine whether the plant belongs to awnless or awned soft varieties. This type of wheat has four features: the shape of the grains, their shade variety, the stem and the consistency. The stem of the plant usually does not have a core, but as for the color of the grains, it is reddish or completely white. The grains are usually oval in shape. The consistency of some plants may be glassy and others mealy, although wheat usually has semi-glassy grains. (5, p.20)

Soft types of wheat are distinguished by the presence of a beard. With a careful study of the grain, it can be seen with the naked eye. The beard is quite thick and consists of long hairs. Wheat is winter and spring. (1, p.45)

It is generally accepted that grain crops came to the European part of Russia from the western and southern parts of Asia. It is believed that they originally grew in the east and north of Afghanistan, in northern India, as well as in the mountainous terrain of Tajikistan. However, during the resettlement of people and as the cultivation methods were mastered, the culture spread over large areas, and at present it is almost impossible to imagine human life without wheat. (5, p.32)

In addition to soft types of wheat, there are also hard ones, which are known to scientists under the name "durum". The Latin name for this variety of culture is *Triticum Durum*. It is not so difficult to distinguish a hard variety from soft wheat: it is enough to study the ear. In all hard varieties, it has a dense and supplemented (with rare exceptions) awn. Awnless species are also known to science, but they are rare. The awn of durum wheat is useful for the plant, and it looks beautiful. Long hairs grow up along the ear and seem to spread along the axis. The scales are pronounced, thanks to which the grain covered with them is reliably protected from external factors. (5, p.33)

When looking at the hard variety of wheat, you can see that its stalks are slightly different from the stalks of the soft types: they are filled with a tissue called the pith. The stem is not always full throughout, usually only its upper part is. Another feature of durum wheat can be called the type of grains. They have an oblong shape, and if they are cut in half, then an angular cut will be visible in diameter. (7, p.52)

In addition to the many varieties and varieties of this cereal, there is a division into winter and spring types. This classification is based on the characteristics of the growth period of a cereal plant. (7, p.53)

Winter wheat is sown from late summer to mid-autumn, it ripens at the beginning or middle of the next summer. This type has a higher yield, but it is best cultivated in areas with a mild climate and snowy winters. During the cold period, the seeds are hardened, saturated with moisture and, at the first heat, quickly sprout and actively grow. (9, p.42)

Spring wheat is sown in the period from March to May; for its full ripening, at least 100 frost-free days are needed. The crop of such cereals is harvested in early autumn. This type is more drought-resistant, so it is easier to tolerate hot sunny days, but does not like neighborhoods with weeds, this can adversely affect the quality of the crop. Spring wheat is known for its excellent baking qualities, but when growing it is important to apply special fertilizers to the soil. (9, p.44)

Grain mass, as a rule, cannot be called homogeneous. In addition to the grain itself, several types of impurities are allowed. Fractions are whole and slightly damaged grains. Impurities include the following types:

- half-damaged by pests or broken grains without determining the type of defects;



- seeds characterized by swelling, a greenish tinge, and also those that have been pressed;
- having damage, with shells of brownish or milky shades;
- those that have sprouted, lost their natural color or deformed;
- particles of spelled, rye and other cereals;
- admixture of various cereals and leguminous plants. (7, p.94)

Weed impurities are:

- residues of organic and mineral origin;
- parts and grains of low-value uncultivated plants;
- grains affected by fusarium, as well as having acquired a black color;
- harmful impurities (for example, the addition of trichosemide, sophora, smut, etc.).  
(7, p.95)

There is a variety of wheat called Tritikum Turgidum in Latin. A lot of call it English. "English" wheat is usually referred to a special group. This is explained by the fact that this variety can have both a classic and a branched ear. By the way, it is very similar to an ear of durum wheat, since it has a long noticeable awn, and in the context, it gives a circle or a square. Often the stems of this culture grow, filling inside with a special tissue. (15, p. 44)  
The grains of this variety of wheat are covered with scales, and a large keel can be seen immediately. The shape of the grains is oval, close to round. According to their structure, the grains are usually semi-glassy and farinaceous. Such wheat is usually spring, but it can also be grown as a winter crop. (1, p.53)

Polish wheat is grown only as a spring crop. In Russia, it is cultivated in several regions of Siberia and near the Caucasus, but it occupies small areas. (6, p.12)

Dwarf wheat. In Latin, a dwarf variety of wheat is called Tritikum Compactum. This name is not given by chance, since the ears of the plant are small. If you look at them, it seems that they were squeezed. (7, p.34)

There are both species rich in awn, and completely devoid of it. Dwarf wheat is cultivated mainly as a winter crop. Its grains are very similar to those produced by soft wheat varieties, but their size is smaller. For the bakery industry, the quality of dwarf wheat plays a less significant role, which affects the prevalence and use of this species. (7, p.35)

Such varieties grow in Asian and American fields. As for Russia, they are grown in the mountainous territories of Transcaucasia. Many dwarf varieties are grown in the Central Asian republics. (7, p.36)

Wheat can grow in a wide range of soil and climatic conditions and is grown in almost all agricultural zones except the tropics. More cold-resistant crops include only barley, potatoes and some fodder grasses; she is also not afraid of heat if it is not combined with high humidity: in the latter case, cultivation becomes unprofitable due to the severe damage caused to the plant by diseases. However, in general, two main “wheat belts” are distinguished - between 30 and 55 ° N. latitude. and between 25 and 40°S, where the annual precipitation averages 300–1100 mm. In their coldest parts, culture is limited to areas where 250-1000 mm of precipitation falls annually, and in the hottest - where their annual amount does not go beyond 500-1800 mm. The optimal crop matures with 250–1000 mm of precipitation per year and its seasonal distribution. Growth proceeds until the temperature falls below 3°C and rises above 32°C with an optimum of 25°C. Too early sowing increases the chances of seedling disease and, like late, is fraught with winter freezing. (7, p. 51)

Spring wheat is sown from March to May, depending on local conditions. The crop is usually harvested when the moisture content of the grain drops to 13%. Spring wheat needs approx. 100 frost free days. Harvesting earlier, when grain moisture is higher, requires drying, and later harvesting reduces the amount of production obtained, since the grain begins to crumble from the ears, and the plants tend to lie down. (9, p.58)

Winter wheat is also grown for green fodder for livestock, which can be let out to graze when seedlings reach a height of 13–20 cm. If it is planned to harvest grain from this field next year, grazing is stopped when the plants start to grow into the tube. In some parts of the US, wheat is sown mixed with winter legumes and cut into hay and silage before flowering.

Attention should be paid to what can destroy the entire wheat crop and what you need to be ready for. One of the most common wheat diseases is stem or line rust. Already 200 years ago, it was known that barberry bushes contribute to infection (the parasitic fungus passes part of its life cycle on them), and laws appeared requiring their destruction. Until now, only its rust-resistant forms are allowed to be bred for decorative purposes. The barberry also serves as a source of new infectious races of the rust fungus - more than three hundred of them are already known. Line rust causes such serious damage that research is underway

around the world to identify races of the parasite that are still unknown to science and create wheat varieties that are resistant to it. (16, p.67)

Other diseases worth mentioning are leaf (brown) and yellow rust, hard (stinking), stem and dust smut, powdery mildew, scab, root rot and root collar rot, two septoria blotches and viral infections (various types of mosaic and yellow dwarfism). The best control measure in all cases is the breeding of resistant varieties. An integrated approach, i.e. The combination of plant genetic resistance with chemical treatments can, in some cases, significantly reduce losses (for example, from smut), but effective remedies for several diseases have not yet been developed. (1, p.63)

Insect pests depend on the area of cultivation. In the United States, the American grain sawfly, wheat gnat, bollworm, and common grass aphid are considered the most serious. Other species spoil grain and flour in warehouses, for example, the tiny flour beetle, flour beetles, grain moth, Mauritanian booger larvae, rice weevil. (1, p.64)

As with diseases, the best way to reduce pest damage is to use wheat varieties that are resistant to them, but unfortunately, no variety is immune to all potentially threatening insects. To other environmentally friendly, i.e. control methods that do not include pesticide treatments include proper soil preparation, the choice of special crop rotation patterns and optimal sowing and harvesting times, plowing the stubble after mowing (the latter method deprives many pests of food). (1, p.66)

### **3.3 Features in production and storages**

One of the main conditions for obtaining a decent wheat harvest is crop rotation. Winter varieties are often sown on black fallow (the field is completely cleared of weeds, and the soil is loose and moist). Cultivation after sunflower, sudan grass or corn is not recommended, since these crops have a very high nutrient uptake. After them, the soils are depleted, wheat lacks nutrients. (2, p.20)

Spring varieties feel good when sown after tilled and leguminous crops. However, in regions with arid climates, spring wheat is best sown on black fallow. Hard varieties are sown exclusively on black fallow. And in no case do they cultivate it two years in a row in the same area. When sowing after other cereal crops, the grain quality drops significantly. The

soil before sowing durum wheat should rest. In the year when the fields remain under black fallow, the soil is treated with herbicides from weeds or removed mechanically. Such activities contribute to the accumulation and preservation of moisture. Before winter, work on snow retention is carried out. To ensure optimal growing conditions for durum wheat, it is necessary:

- maximum accumulation of moisture in the substrate. When its content in the upper soil layer (20 cm) is less than 20 mm, sowing is canceled;
- on the fields after legumes or on fallows, moldboard plowing is carried out;
- before sowing and during cultivation, tillage is carried out to the sowing depth (6 cm);
- if it rained before sowing, then the cultivation is repeated. (9, p.43)

Seeds of durum winter wheat are embedded in the soil to a depth of 4-6 cm. When sowing spring crops, the condition of the soil is considered. The crop is sown in rows with an interval of 15 cm. Soft wheat remains strategically important for Russia, but durum varieties give more useful flour. However, they need a drier climate, so this species does not grow well in most regions of Russia. (5, p.47)

### **3.3.1 Features of growing winter wheat**

The wheat counts an unsightly agricultural crop, which is precisely calculated by the mortar and glass. In the hot springs of the regions, the quality will be a small, high school at around 40 hours in the beginning of the beginning. The seriousness of the day of the world, the school in the light of the world grows less than it will be, the green sorrel hurts to dryness, as soon as the winter is well tolerated by cold and warm temperatures. They hold frosts up to -25 km at the snow cover. If there is no snow, the plants can move on the temperature - 16-18 BC. (15, p.60)

For the sowing of seeds of winter wheat, sowing in the ground, I use micro- and macro-elements. In the absence of minerals, the level of culture is reduced. For the sowing of winter wheat, it is best to cover chernozems, weak soil and chestnut trees with a pH of 6.5-7. (15, p.62)

### Seed Preparation

For sowing, seeds of winter wheat with high crops are used. Such sowing material is based on the best physical and biological characteristics. Before sowing the same large and healthy seeds are processed, the following agricultural groups are used: feeding with pesticides and agrochemicals, used for use in the territory of Russia; enrichment - the application of the grain of the hydrophobic polymeric substance with fungicides, waxes and strains. (20, p.34) Conservation is needed to protect against seed and stained infections and increase the stability of plants. With the help of insemination, the seeds are protected from molds, mechanical coatings and other non-volatile materials. (20, p.35)

### Growth Phases

The following phases of winter wheat growth are distinguished: germination, tillering, stalking, earing, flowering and maturation. The first stage under normal conditions takes from 15 to 25 days. The friendly emergence of seedlings is observed at a temperature of 12-17 C, and intensive growth occurs at 20-25 C. The tillering phase of winter wheat occurs after the formation of 3-4 leaves. The plant has nodular roots and lateral shoots. The process begins in spring or autumn at a temperature of 6-10 C, when wheat growth slows down. Tillering increases if nitrogen fertilizers are introduced into the soil. (7, p.58)

The stage of stemming or exit into the tube occurs about 30 days after the beginning of spring growth. At this stage, the first stem node is formed at a height of 3-5 cm from the soil surface. After another 30 days, the stage of earing begins, which is accompanied by the release of the ear. The intensity of this stage depends on the amount of moisture and nutrients in the soil. The earing period is considered the most favorable for the treatment of crops with fungicides. The flowering of winter wheat begins 2-3 days after the ear leaves and usually lasts a week. At the stage of maturation, the grain is formed and poured. The duration of this stage depends on weather conditions: in drought, the process accelerates, and during rains it slows down. (7, p. 59)

### Care Of Crops

Usually the care includes 3 procedures: rolling, harrowing and protection. Post-sowing rolling with soil compaction improves the contact of seeds with the ground, reduces moisture loss and ensures a more friendly appearance of seedlings. This method is not used during rain and on clay soils. Early spring harrowing is used to loosen the soil, which improves

aeration and prevents the germination of weeds. Seed protection means treatment with industrial compounds: herbicides, fungicides, top dressing. (22, p. 131)

### Fertilizers

Winter wheat processing is a mandatory stage of care. Herbicides are used to control weeds, pests are destroyed with insecticides. Fungicides, if necessary, treat bacterial diseases.

For fertilizing this crop, mineral fertilizers are usually used – nitrogenous and phosphoric. Organic mixtures are used when the humus content in the soil is less than 2%. Almost all phosphorus fertilizers are applied to the soil before sowing. The fields are treated with granulated superphosphate, and a small amount of this composition is additionally added in autumn or early spring. (20, p.44)

Nitrogenous fertilizing is used:

- during pre-sowing cultivation (30 kg/ha);
- the tillering phase of winter wheat;
- the beginning of stalking (60-70 kg/ha);
- during earing and flowering.

On poor soils, nitrogenous fertilizing is recommended to be applied in ammonium form, since in this case fertilizers are washed out less. (20, p.45)

### Irrigation Rules

The low level of moisture in the soil reduces the yield of winter wheat. Hydration is especially important in the early stages of culture development, when the root system is laid. In autumn, plants receive moisture from the topsoil due to rains. The same thing happens in spring during the melting of snow masses. Subsequently, when the air temperature rises, the soil begins to dry out, which is why wheat has to extract water at a depth of up to 1 m with the help of a developed root system. However, in very dry weather, moisture can go even deeper, so arable land in arid regions requires regular watering. (15, p.77)

Irrigation of winter crops is necessary during the autumn growing season if there is not enough precipitation. As a rule, arable land is watered once, but very abundantly. The fields are also irrigated in spring, provided that the soil is soaked with water by less than 2 m. In summer, wheat is watered only during drought. This is done at least twice – during the earing period and at the initial stage of grain maturation. (15, p.78)

### Harvesting

The timing and methods of harvesting are chosen considering weather conditions, the height and density of the stem, the clogging of crops and the tendency to shedding. Winter wheat harvesting begins in the phase of full maturity of seeds, when their moisture content is 14-17%. Cleaning is carried out in a direct or separate way. The first option is preferable because it allows you to save most of the crop. A separate or two-phase method is used for harvesting tall and dense varieties, with unevenly maturing crops and high weed infestation. (15, p.81)

A common method of harvesting winter wheat is direct harvesting, and in some cases a separate method is used. The first one is used when the crops are fully ripe, and the moisture content of the grain is a maximum of 18%. Separately, high wheat varieties are harvested, which can unevenly ripen and lie down. In addition, this method is used with high contamination of the area, grain moisture - 30%, stem density - 300 pcs / sq. m. (15, p.84)

### **3.3.2 Crop storage**

For a freshly harvested crop, it is necessary to create proper storage conditions so that the grain mass does not change the quality indicators. Its condition is affected by the development of microorganisms and pests under the influence of the external environment. High humidity, improper temperature or air access to the granary provoke the spread of microorganisms and as a result causes diseases of the grain mass. Before laying for storage, it is necessary to clean the grain from impurities and dry it, if necessary, disinfect it from pests. During storage, it is necessary to ensure constant monitoring of the conditions of detention. Such methods are aeration, ventilation, cooling, canning and others. (27, p.148)

Grain elevators are used for grain storage – specially equipped warehouse complexes. First, the wheat is weighed, then cleaned with separator machines and dried, after which it is sent to silos. The safety of grain depends on several factors:

- humidity and ambient temperature;
- intensity of biochemical processes taking place in wheat;
- the presence or absence of harmful microorganisms and insects. (14, p.33)

Therefore, the grain is pre-dried and stored at 10-12 C in silos, some of which are equipped with installations for ventilation and disinfection. Periodically, the temperature of the product is measured using thermal suspensions, which are installed at different levels.

Each elevator has a compartment for shipment with a system of hopper. Grain and seeds can be stored in three types of granaries: a hangar for floor grain storage, as well as silos made of concrete or metal alloy. They differ in functionality, have their advantages and disadvantages. (26, p.36)

The ground warehouse provides such advantages as a permanent storage regime, a small degree of mechanical damage to seeds, the ability to store different batches of raw materials separately. The disadvantages of outdoor grain storage are in the absence of mechanization. With this method, raw materials are stored uncompact, occupies large areas. It is impossible to provide decent ventilation in the grain mound. Nevertheless, this method is well suited for long-term storage, especially of corn, seeds, oilseeds. (25, p.14)

Concrete silo is a reliable structure for temporary and long-term grain storage. It has a high level of thermal insulation, so the quality of the contents will not depend on weather conditions. Such repositories are not afraid of frequent reboots. However, it is quite difficult to maintain such concrete wells. Also, the proportion of crushed particles increases when rubbing against the walls and bottom. (14, p. 37)

Metal silo is the most modern bunker, has many types and sizes. Such storage allows you to:

- equip the hopper with various mechanisms;
- carry out aeration;
- storage quality control.

Such a bunker is easy to choose for your own production volumes. The disadvantage of a metal silo is a low level of thermal insulation, it does not protect the contents from low and high temperatures. Such devices are more convenient as storage devices or temporary storage. (27, p.234)

### **3.3.3 Storage requirements**

In order to avoid spoilage and loss of grain, elevators should be equipped in accordance with all modern technical requirements of granaries. The technologies of acceptance, unloading, storage and subsequent delivery of grain for transportation must also be observed. Granaries and warehouses of products in technical and sanitary terms must meet the following basic requirements:



- there should be no foreign odors, except those peculiar to the grain mass
- premises/silos should not be infected with mites, molds, insect pests. Otherwise, the room must be sanitized.
- there should be insulation from groundwater, as well as water drainage systems of granaries should be sufficiently sealed, without cracks, all technological openings and doors should be tightly closed. (29, p. 57)

It is important to note that any granary must be kept clean, so cleaning the premises/ cleaning of the equipment should be of a permanent systematic nature.

Metal silos should be equipped with active ventilation systems that provide a margin of pressure and volume of air required for proper ventilation, approximately 6 times the capacity of the silos themselves. (30, p. 46)

Also, each silo should be equipped with a thermometry system that allows you to control the temperature of grain during long-term storage. The effect of the storage duration of winter wheat grain on quality indicators. During long-term storage, the qualitative and quantitative characteristics of gluten, starch, fat and other components of grain change. If you store grain for 240 days, the amount of gluten in it decreases and its quality improves, and after 2 years its elasticity decreases. In addition, this indicator is influenced by the variety of culture. During six months of storage, the starch content in the grain may increase by 0.5%. From 6 months to 2 years, this indicator does not change. But if stored for more than 30 months, the starch content may decrease and be even less than the initial value. The fat level also reacts to long-term storage – the longer, the lower the content. However, due to the presence of grain in the storage for a long period, the quantitative and qualitative composition of phosphorus, potassium and ash does not change. (30, p. 48)

Compliance with the technology of winter wheat production and grain storage ensures a high economic effect of the activity. At all stages of the development of culture, it is necessary to carefully monitor the condition of crops in order to achieve profitable results. In addition, if it is possible to store the harvest, it is necessary to create appropriate conditions for a longer period until the profitable sale of grain. The demand for wheat has been stable for a decade, so a properly selected technology in accordance with natural and climatic conditions and careful agronomic support during the growing season will ensure an effective result. (23, p. 46)

### **3.4 Global market overview**

According to the Food and Agriculture Organization (FAO) UN Every tenth person on earth is malnourished or does not have constant access to food. Bread plays an important role in the food culture of almost all countries of the world. Therefore, food security, both in the global aspect and in the context of individual countries, largely depends on the level of grain consumption per capita. (24)

The grain market is the most important element in the system of agri-food markets. In addition, grain is one of the main food exchange commodities.

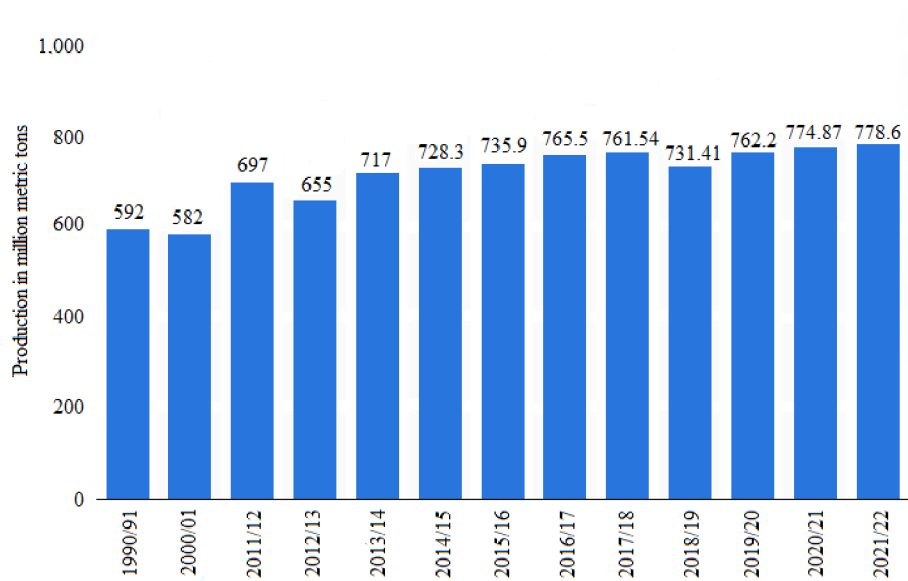
But the market demand is formed not for food grain, but for its individual types and not just for the same type of grain, but for the same type of grain of different quality, different intended use. Wheat is the main commodity type of grain – in world production its share is about 40%, and in world trade - 50% (6, p.1241)

Wheat, which has a deep history in human civilization, remains one of the most important products in world trade. It is currently the most cultivated cereal in the world. Its sown area exceeds 220 million hectares. Both developing and developed countries are involved in wheat production. Developing regions account for 53% of the total harvested area and 50% of production. Wheat provides more than 35% of the calories consumed by grains in developing countries, 74% in developed countries and 41% worldwide through direct consumption. Almost 70% of wheat is used for food, and the share of animal feed and industrial processing is 20% and 2-3% respectively. (12, p.19)

#### **3.4.1 World production**

According to the International Grain Council (IUCN, 2021), the estimated wheat production in the period 2019/2020 amounted to 763.7 million tons, of which more than 523.3 and 137.4 million tons were used for food and livestock feed, respectively. The volume of wheat for industrial processing has reached 24 million tons. (Figure 1)

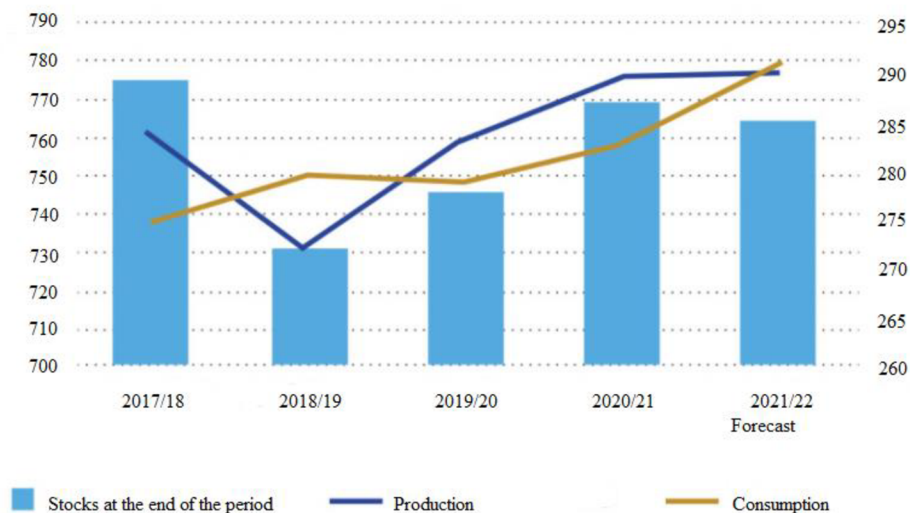
Figure 1 Global wheat production from 2011/2012 to 2021/2022 (in million metric tons)



Source: USDA Foreign Agricultural Service

Compared to 1998, wheat production increased by 29.5%. Over the past ten years, there has also been a steady growth trend in wheat production - except for 2012 and 2018, in which adverse weather conditions negatively affected the gross wheat harvest in different countries. Wheat is a crop that does not impose special requirements on the conditions of cultivation and can grow in various agricultural zones with a wide range of climatic conditions.

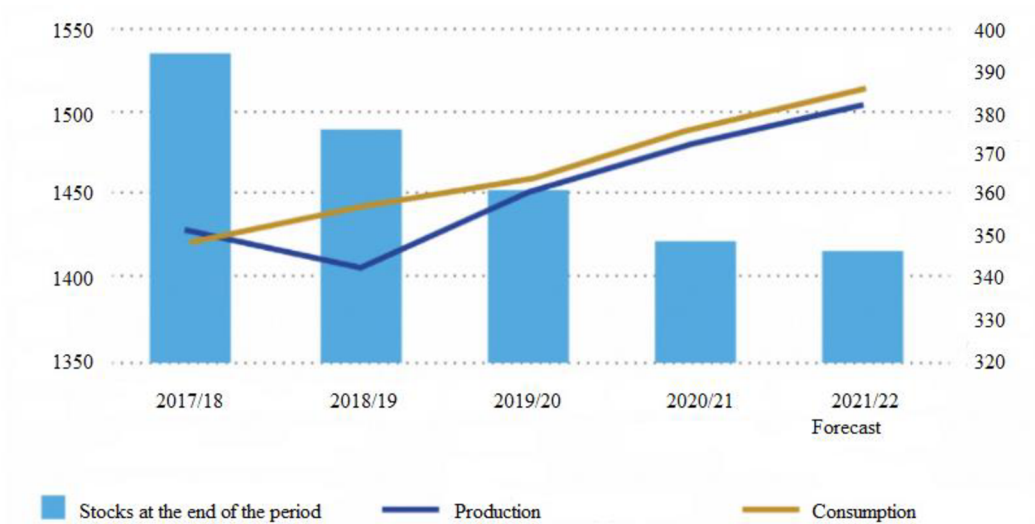
Figure 2 Production, consumption and stocks of wheat in the world in 2017-2021



Source: FAO statistics

In accordance with the forecasts of the US Department of Agriculture, at the end of the year, Russia should ensure the gross wheat harvest at the level of 72.5 million tons, while the Ministry of Agriculture of the Russian Federation estimates it at the level of 81 million tons. The current harvest data show that as of October 13, 2021, 76.5 million tons of wheat have already been harvested. Last year, by this time, a record 87 million tons of wheat were harvested. The given data allows us to hope for a wheat harvest at the level of 78 million tons, which is slightly lower than the forecasts of the Russian Ministry of Agriculture, but higher than the forecasts of the US Department of Agriculture. (31) (Figure 2)

Figure 3 Production, consumption and stocks of feed grains in the world in 2017-2021



Source: FAO statistics

The forecast for the production of feed grains in the world in 2021 is 1,504 million tons, which is 1.6% higher than a year earlier. In recent years, the consumption of feed grains is not covered by its production, hence the observed reduction in stocks. The US Department of Agriculture estimates the harvest of feed grain in Russia at 38.7 million tons and gives forecasts for its export up to 9.18 million tons, which by the end of the year will cover 30.8 million tons of consumption and form reserves in the amount of 1.25 million tons. Russia's share in the world feed grain market is 2.6%. (31) (Figure 3)

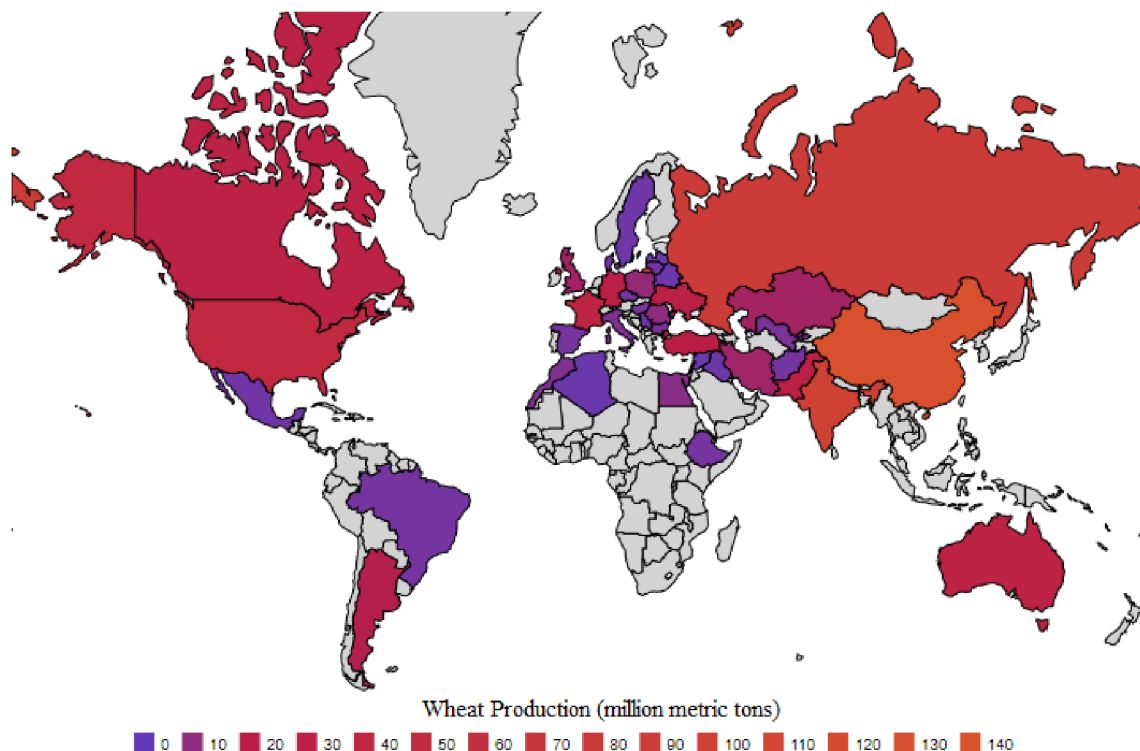
As of October 13, 2021, less than 5 million hectares remain to be harvested, which is approximately 10.5% of all sown areas. But already now 18.5 million tons of barley, 5.9 million tons of corn have been harvested, and the total grain harvest (except for wheat),

according to the forecasts of the Russian Ministry of Agriculture, should be 43.4 million tons. (32)

Around 21% of the global wheat producing amounting to about 176 million tons is traded by the top wheat exporting countries around the world. The consumption of wheat around the world has been increasing by 1.5% every year for the past two decades while the global wheat production is forecasted to grow at a CAGR of around 2.5% for the next five years. The top 10 wheat producing countries in the world manage to maintain an average surplus stock of around 125 million tons in total calculated after global consumption and trading. Also, these countries collectively account for almost 510 million tons of the global wheat production. The global wheat market is dominated by China as it is among the top wheat producing countries in the world. The top wheat producing countries are significant contributors to the global food supply as they are also the top wheat exporting countries around the world. It is estimated that the developing economies consume almost 75% of the global wheat production and wheat constitutes around 25% of the total food grain production across the world. On analyzing global wheat production by country, it is seen that the first three top wheat producing countries together comprise almost half of the total wheat production in the world. The global wheat production was estimated to be around 758 million tons as the output has increased significantly in the recent times owing to favorable conditions. The global wheat production market is dominated by China as it is the largest wheat producing country in the world.

Figure 4 is a world map of wheat production where we can see the distribution of production in tons around the world. As we can see, the main production of wheat is concentrated in Eurasia, America and Australia. Wheat production is least common in South America and Africa.

Figure 4 Map of global wheat production (million metric tons)



Source: FAO statistics

China remains the world's leading wheat producer, with the area harvested decreasing and yields increasing for the second consecutive year. The country harvested 134.33 mln. tons of wheat in 2020/21, slightly short of its 2017/18 record. (Table 1)

Table 1 Wheat production by country in 2021

Country	Wheat production
China	134 254 710 tons
India	107 590 000 tons
Russia	85 896 326 tons
United States	49 690 680 tons
Canada	35 183 000 tons
France	30 144 110 tons
Pakistan	25 247 511 tons
Ukraine	24 912 350 tons
Germany	22 172 100 tons
Turkey	20 500 000 tons

Source: FAO statistics

Wheat is India's second most important cereal crop. In 2020/21, yields remained at last year's level, but through the 7% increase in sown area and the heaviest monsoon rains in 25 years, production increased by 4.2 mln.t or 4%, a record for the country. As in China, the bulk of wheat is sold domestically and only 1.5 mln.t is exported.

Russia's wheat harvest in 2020/21 was one of the highest ever recorded and exceeded expectations. In addition to a 5% increase in the harvested area, yields also improved, allowing for a 16% higher crop than in the previous year. Russia is one of the leaders in wheat exports with 39 mln.t of shipment in 2020/21, 13% up YoY. It is also worth noting that restrictions on grain exports have been in place in Russia since 15 February. The export tax will be in effect until 1 July 2021: 17.5 mln.t of grain (wheat, rye, barley and corn) may be exported.

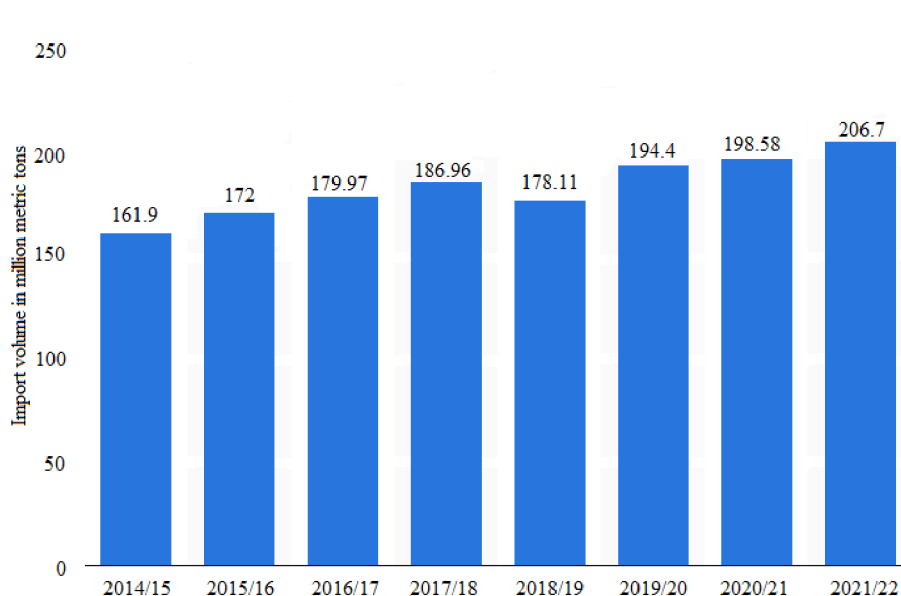
Wheat is the principal cereal crop in the United States, and it is produced across the country. US farmers increased their winter wheat sown area for the first time in eight years. Producers were spurred on by higher grain prices amid strong demand and bad weather in several producing countries. At the same time, harvested area decreased slightly (by 2%). Production has been at a low level for the last 3 years (compared to previous seasons). More than half of all wheat produced is exported. In the 2020/21 season, 26.8 mln.t have already been shipped.

### **3.4.2 Import**

Globally, wheat imports during 2021 cost a total US\$58.6 billion in international purchases. The overall value of imported wheat for all buying countries rose by an average 38.4% since 2017 when the world's tally for wheat purchases equaled \$42.3 billion.

From 2020 to 2021, the worldwide bill for imported wheat accelerated by 20.5%. Figure 5 shows data on world wheat imports in the period from 2015 to 2022. This graph, as we can see, repeats the pattern of the world wheat production graph, we can also note an upward trend of increasing imports every year, except for 2018, as we noted earlier in 2018, there were unfavorable climatic conditions that affected the volume of production, thus reducing and volume of imports. (Figure 5)

Figure 5 Wheat import volume worldwide from 2014/2015 to 2021/2022



Source: Statista.com

By value, the 5 biggest buyers of wheat (Egypt, Indonesia, Turkey, mainland China and Nigeria) purchased roughly one quarter (24.7%) of overall wheat imports in 2020. In 2021 5 main importers of wheat changed to Indonesia, Nigeria, mainland China, Turkey and Egypt, which purchased almost one quarter (24.2%) of overall wheat imports bought in 2021.

Among continents, Asian countries accounted for the highest dollar worth of overall wheat imported during 2020 with purchases valued at \$21.1 billion or 43.6% of the global total. In second place were African importers at 26.6% while 17.4% of worldwide wheat imports was delivered to Europe. In 2021 with purchases valued at \$25.2 billion or 43% of the global total. In second place were African importers at 26.8% while 17.5% of worldwide wheat imports was delivered to Europe. (Table 2,3)

Smaller percentages arrived in Latin America (8.3%) excluding Mexico but including the Caribbean, North America (3.2%) and Oceania (0.8%) led by New Zealand and Australia.



Table 2 List of Wheat Importing Countries in 2020, 2021

Country	Wheat imports (US\$)	Change 2019-2020,%
Egypt	2.693 billion	-10,9
Indonesia	2.616 billion	-6,5
Turkey	2.334 billion	1,4
China	2.260 billion	150,8
Nigeria	2.056 billion	62,3
Italy	2.043 billion	12,1
Algeria	1.645 billion	11,4
Philippines	1.573 billion	-8,3
Japan	1.525 billion	3,5
Morocco	1.423 billion	48,2

Source: Worldstopexports.com

Table 3 List of Wheat Importing Countries in 2021

Country	Wheat imports (US\$)
Indonesia	3.5 billion
Nigeria	2.7 billion
China	2.72 billion
Turkey	2.69 billion
Egypt	2.47 billion
Algeria	2.34 billion
Italy	2.30 billion
Bangladesh	1.96 billion
Philippines	1.95 billion
Japan	1.79 billion

Source: Worldstopexports.com

Among the above countries, the fastest-growing markets for wheat since 2019 were: mainland China (up 150.8%), Nigeria (up 62.3%), Morocco (up 48.2%) and Italy (up 12.1%). Among the above countries, the fastest-growing markets for wheat since 2020 were: Bangladesh (up 52.1%), Algeria (up 41.9%) and South Korea (up 39%). The lone decliner in its imported wheat purchases was Egypt via its -8.5% slowdown year over year.

Those countries that posted declines in their imported wheat purchases were led by: Netherlands (down -16.4%), Egypt (down -10.9%), Brazil (down -9.9%) and Bangladesh

(down -8.9%). By value, the listed 15 countries purchased 53.2% of all wheat imported in 2020.

As we already know Egypt is the biggest importer of the wheat in 2020. Below are the top suppliers from which Egypt imported the highest dollar value worth of wheat during 2020. (Table 4)

Table 4 Top Egypt suppliers of wheat

Country	Wheat imports (US \$)
Russia	1.6 billion
Ukraine	690.4 million
France	176.8 million
Romania	87.7 million
Australia	60.7 million
United States	22.4 million
Bulgaria	13.9 million
Lithuania	7 million
Hungary	5.7 million
Canada	2.5 million

Source: Worldstopexports.com

Overall, the value of Egyptian wheat imports decreased by an average -10.9% from all supplying countries since 2019 when wheat purchases were valued at \$3.02 billion.

The situation as we can see changed and for 2021 Indonesia was the second importing wheat country and in 2021 become the leader in importing wheat. List of countries that supply their grain to Indonesia: (Table 5)

Table 5 Top Indonesia suppliers of wheat

Country	Wheat imports (US \$)
Ukraine	707.6 million
Canada	639.3 million
Argentina	627.7 million
United States	341.8 million
Australia	239.8 million
Bulgaria	29.1 million
Russia	15.6 million
Moldova	15.1 million

Source: Worldstopexports.com

Overall, the value of Indonesia's imported wheat declined by an average -6.5% from all supplying countries since 2019 when wheat purchased cost \$2.8 billion.

Table 6 Top Indonesia suppliers of wheat

Country	Wheat imports 2020(US\$)	Change 2020-2021,%
Australia	1.5 billion	515,1
Ukraine	919.4 million	29,9
Canada	639.3 million	-0,01
Argentina	169.5 million	-73
United States	134.7 million	60,6
India	101 million	-
Bulgaria	58 million	99,3

Source: Worldstopexports.com

As we can see supplying Indonesia countries in 2021 have changed a lot. The biggest Indonesia supplier is Australia which growth rate from 2020 is 515.1% Overall, the value of Indonesia's imported wheat increased by an average 24.2% from all supplying countries since 2020 when wheat purchased cost \$2.6 billion. (Table 6)

Turkey is the third largest importer of wheat. Consider its main supplier countries. (Table 7)

Table 7 Top Turkey suppliers of wheat

Country	Wheat imports (US \$)
Russia	1.5 billion
Ukraine	246.4 million
Canada	151.1 million
Mexico	112.5 million
Lithuania	110.4 million
Bulgaria	34.1 million
Spain	33.8 million
Latvia	27.4 million
Syrian Arab Republic	27.3 million
Poland	26.9 million
Estonia	17.6 million
Czech Republic	12.7 million
Germany	7.2 million
Kazakhstan	6.6 million

Source: Worldstopexports.com

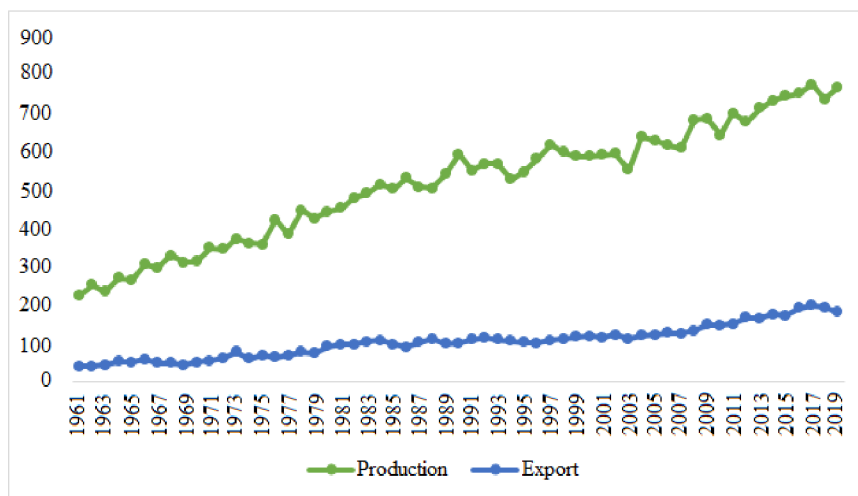
Among the above countries, the fastest-growing suppliers of wheat to Turkey since 2019 were: Spain (up 510.6%), Poland (up 369.9%), Bosnia/Herzegovina (up 111.5%) and Lithuania (up 67.8%). Countries that experienced declines in the value of their wheat supplied to Turkish importers included: Kazakhstan (down -85.4%), Latvia (down -40.3%), Canada (down -28.2%) and Mexico (down -3.9%). Overall, the value of Turkey's imported wheat increased by an average 1.4% from all supplying countries since 2019 when wheat purchased cost \$2.3 billion.

### **3.4.3 Export**

According to the International Grains Council (IGC, 2021), estimated wheat production for the period 2019/2020 was 763.7 million tons, of which more than 523.3 and 137.4 million tons were used for food and livestock feed, respectively. The volume of wheat for industrial processing reached 24 million tons. World wheat exports amounted to 184.3 million tons. MSZ forecasts that wheat production in 2020/2021 will reach 768 million tons, while consumption and exports will increase to 531 and 186.8 million tons, respectively. (33) Figure 6 shows trends in world wheat production and exports. According to the data presented, in 1961 the production and export of wheat amounted to 222 and 40 million tons, respectively. In 2019, production reached 766 million tons, an increase of 3.5 times. In the same year, wheat exports amounted to 180 million tons, an increase of 4.5 times. In value terms, world wheat trade showed significant growth. If in 1961 world exports amounted to \$2.5 billion, then in 2019 it increased to \$39.6 billion.

Table 8 and 9 shows the main exporters of wheat. Russia ranks first in the list of major wheat exporting countries. In 2019, its exports amounted to 32 million tons. Wheat shipments from the US amounted to 27 million tons, while Canada's exports reached 23 million tons.

Figure 6 World production and export of wheat, millions of tons



Source: FAO statistics

Ukraine ranked fifth and exported 18 million tons in 2020. Kazakhstan, in turn, supplied 5 million tons of wheat. In 2020, Russia's income from wheat exports amounted to \$7.9 billion. The US and Canada exported \$6.3 and \$6.3 billion worth of wheat, respectively. Ukraine and Kazakhstan, in turn, earned \$3.5 billion and \$1 billion, respectively. This means that wheat exports account for a significant share of non-commodity exports of Eurasian countries. (33)

Table 8 List of countries by wheat exports in USD (2020)

Country	Value in thousands of USD
Russia	7 918 294
USA	6 318 111
Canada	6 317 889
France	4 528 591
Ukraine	3 594 217
Australia	2 698 498
Germany	2 105 865
Argentina	2 029 494
Kazakhstan	1 137 140
Poland	1 047 399

Source: FAO statistics

Table 9 List of countries by wheat exports in tones (2020)

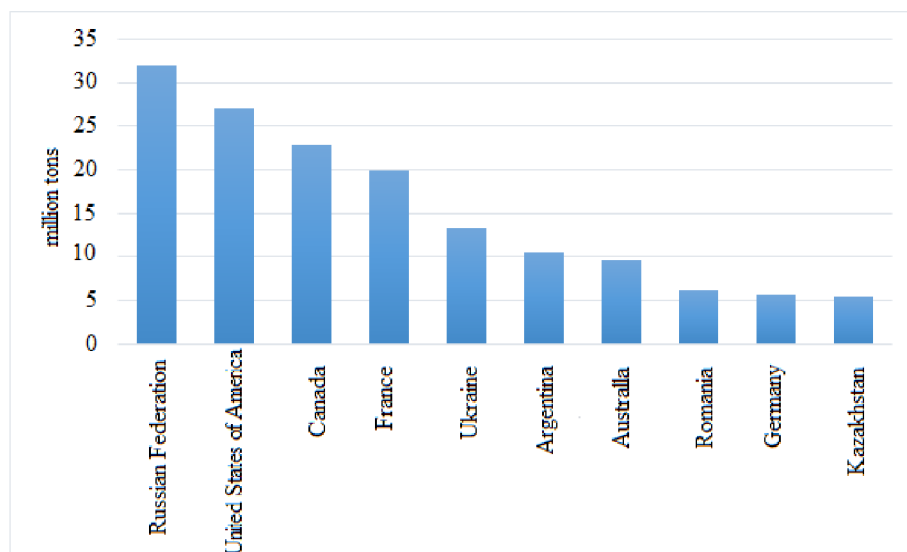
Country	Quantity tonnes
Russia	37 267 014
USA	26 131 626
Canada	26 110 509
France	19 792 597
Ukraine	18 055 673
Australia	10 400 418
Argentina	10 196 931
Germany	9 259 493
Kazakhstan	5 198 943
Poland	4 689 130

Source: FAO statistics

Consequently, the countries of the Eurasian region play an important role in world wheat exports. Various studies show the importance of Russia, Ukraine and Kazakhstan for international grain markets and global food security. In particular, the harvest in these countries or their policies regarding the regulation of grain markets have a significant impact on world markets. For example, poor harvests, restrictions or bans on exports lead to higher world prices. Higher prices are unprofitable for consumers, but at the same time can be beneficial for producers. Price increases generally do not affect food security in high-income countries. However, the economic costs for low-income net grain importers are high, even though their farmers may benefit from higher prices. (18, p.56) (Figure7)

The recent pandemic has disrupted global supply chains in many sectors, including agriculture. Despite expected high levels of wheat production, there is concern that, for political reasons, governments may respond to the uncertainty of the overall situation by restricting or banning wheat exports, as well as creating precautionary reserves. Such measures may affect global trade flows and harm all parties involved, while being counterproductive. (34, p.91)

Figure 7 Major wheat exporters, million tons



Source: FAO statistics

It should be noted that dependence on wheat in low-income countries began after World War II and increased after the 1970s. However, dependence on food imports does not necessarily mean food insecurity. At the same time, dependence on wheat may well be a significant source of food insecurity when combined with other factors, such as income levels. Therefore, high dependence on wheat imports can be seen as a food security issue in low-income countries, since wheat-based products make up a relatively high percentage of their total cereal consumption. (35, p.102)

For example, the Central Asian countries spend most of their income on food consumption. In Tajikistan this share is 63% and wheat, mostly in the form of bread, accounts for 40% to 60% of total daily calories. As a result, rising food prices lead to social and political unrest. For example, rising prices sparked public protests in Uzbekistan in September 2007, in Tajikistan in February 2008, and in Kyrgyzstan in April 2010. Therefore, self-sufficiency in wheat is important for local governments. Local production in most countries does not meet their domestic demand. Consequently, on average, imports account for 41% of wheat consumption in Central Asia, and Kazakhstan remains the exclusive supplier. The costs of wheat trade in the region are high due to high transport costs and unofficial payments. (36, p.10)

Wheat prices have changed significantly. In December 1990, the price per metric ton of wheat was \$113.2 dollars. In December 2000, they rose to \$128 dollars. Since the early 2000s, prices began to rise and peaked in March 2008 at almost \$440 dollars. The global financial crisis and a significant decline in oil prices had a negative impact on wheat prices. In September 2020, they amounted to \$198.4. (37)

Most countries resisted the liberalization of agricultural trade, and the sector was only included in the eighth round of multilateral trade negotiations, known as the Uruguay Round. The share of agriculture in world trade remains low, but the sector is highly distorted. However, due to the relatively high level of protection, the sector accounts for almost 70% of the potential real gains from trade reform. Thus, the economic costs of import tariffs and tariff quotas remain significant. (38, p.94)

Understanding the importance of trade in agricultural products, many countries have liberalized their trade policies. Although tariffs on agricultural products remain the highest, the applied tariffs have been substantially reduced. In particular, the average agricultural tariff worldwide was reduced by 27.4% through multilateral, unilateral and regional concessions. It should be noted that the applied protection of agriculture is much lower than allowed by multilateral discipline within the World Trade Organization. Moreover, this reduction was mainly driven by voluntary tariff cuts and regional trade agreements. (39, p.10)

Thus, wheat plays an important role in many countries and provides a significant proportion of daily calories. Both developing and developed countries produce wheat. Since local production in most countries does not meet domestic needs, wheat imports remain key to food security. The countries of the Eurasian region, such as Russia, Ukraine and Kazakhstan, play an important role in the global wheat market. Their decisions regarding wheat exports affect world prices and consumption. Higher wheat prices are causing political unrest in many countries. Therefore, these countries and other wheat exporters must consider the economic and political implications of their decisions. Importantly, countries have begun to liberalize their food trade policies and have achieved reductions in tariff and non-tariff barriers. This policy can lead to lower prices and increase their food security. (18, p. 78)



## **4. Practical Part**

### **4.1 Russian grain market overview**

The grain market has an important socio-economic significance for any national economy. The special position of the grain market in the Russian economy is due, firstly, to the fact that bread and bakery products - derived products of grain crops – are the basis of the diet of the population of the country. Secondly, grain to a greater extent ensures the food security of the state since it serves as the basis of concentrated feed used in animal husbandry. Thirdly, the unique features of grain as a commodity provide a capacious sales market and priority in the formation of regional food funds. Further, the grain market forms a significant share of budget revenues at different levels. In the end, the grain market is particularly economically attractive for multinational corporations. The grain market is of system-forming importance throughout the country. (19, p.53)

The development of the domestic grain market throughout the historical stage was very contradictory. Thus, having relatively huge land and cheap labor resources for the cultivation of almost all grain crops, Russia almost constantly experienced a shortage of certain types of grain due to their insufficient production and irrational use.

The Russian grain market has already passed the stage of formation, although it differs in economic characteristics from grain markets in countries with developed market economies. Its characteristic features at present, in our opinion, are:

- inelasticity of demand;
  - increasing capacity of the feed grain market;
  - increase in the supply of grain for commercial purposes;
  - disproportionality of grain crops in the structure of the grain wedge (in comparison with the zonal recommendations of the optimal ratio);
  - expansion of the circle of participants in trade relations, including through foreign buyers.
- (12, p.22)

At present, the situation in the Russian grain market is increasing the complexity of coordinating the interests of its participants in the national and world arenas. So, demand and higher profitability of trading operations for the state and large grain sellers limits its commercial mass in the domestic market or “forces” to look for schemes for manipulating

the quality characteristics of grain in order to reduce its classiness in the production of flour used to bake bread for the general population. In addition, the high dependence of grain supply volumes on weather conditions, as well as sales prices on fluctuations in market conditions, poorly predictable and highly dynamic, the completeness of the infrastructural content of the country's territories determine the specifics of the organization of the grain market and its development. (40, p.80)

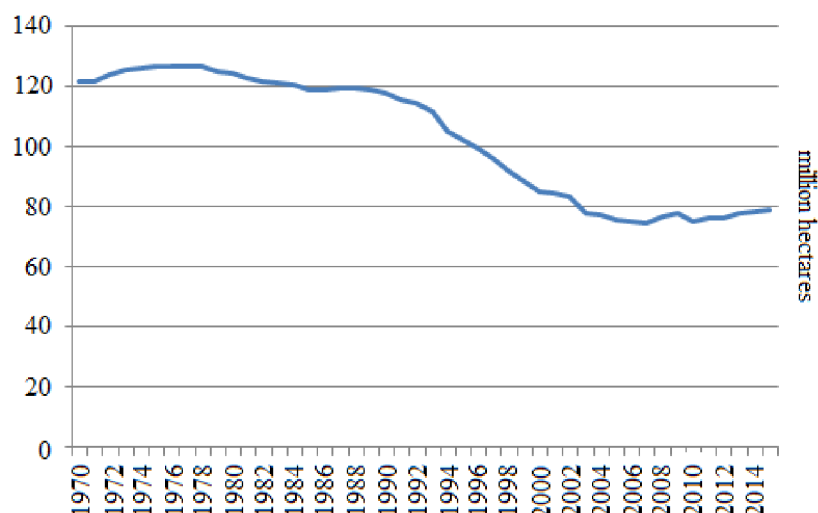
## **4.2 Crop area**

The area of crops in the RSFSR grew until 1975-1976, sown areas had 126.771 million hectares. The area of arable land also reached its maximum value – 133.9 million hectares. 95% of arable land in the RSFSR was intended by crops. The situation remained stable until 1978. Since 1979, there has been a slight decrease in the acreage, which stopped in 1985-1988.

In 1989, there were 132.8 million hectares of arable land in the RSFSR (a decrease of 1.1 million hectares over 10 years), 119.058 million hectares (90% of the total arable land) were sown with crops. The area of pure fallows was 13.722 million hectares, almost 100% of arable land in the RSFSR was subjected to cultivation. (Figure 8)

Since 1989 a landslide decline in sown areas begins, which continued until 2007. Since 2008 long-term losses begin to win back. Although in 2015 the area under crops did not even reach the value of 2002. The data testify to the abandonment of a huge part of the land in Russia. In principle, statistically, in terms of area, arable land in Russia has not lost much since 1976. The decrease by 2015 was only about 10%. But if almost 100% of arable land was cultivated in the RSFSR, then in 2015 only a quarter (about 30 million hectares) of arable land fell out of circulation. Obviously, the long-term absence of agricultural activity on these lands makes it difficult to return these lands to circulation.

Figure 8 Change in sown areas in the RSFSR (Russia) 1970-2015, million ha



Source: Rosstat (rosstat.gov.ru)

As we can see, the dependence of total sown areas and areas under wheat are practically not interconnected. In the 1990s, there was an agricultural crisis in Russia due to political instability, which later led to stagnation and a decrease in the efficiency of grain production in general, including wheat. Nevertheless, in the second half of the 2000s, the situation begins to stabilize, and the wheat area first returns to its original state before the crisis, and after 2015 it receives a new impetus for its development. The growth rate of wheat sown area over the past decade was 10.6% (Table 10)

According to the results of the sowing campaign, the area under wheat in Russia in 2021 amounted to 28,781.7 thousand hectares, which is 2.2% lower than a year ago. Due to the reduction in areas in 2021, wheat harvests also decreased - to 76,014.1 thousand tons. This is estimated to be 11.5% less than last year. In addition to the reduction in area, the harvest was also affected by the decrease in yields in 2021.

Table 10 Sowing areas of crops 1990-2020 in thousand hectares

SOWING AREA OF AGRICULTURAL CROPS IN THE RUSSIAN FEDERATION (farms of all categories; thousand hectares)																
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
The whole sown area	117705	115508	114591	111827	105340	102540	99481	96264	91227	87742	84670	83820	83468	78297	77323	75837
Wheat	24244	23152	24284	24665	22191	23909	25708	26058	26103	23022	23205	23764	25657	22158	24003	25343
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
The whole sown area	75277	74698	76769	77548	74861	76285	75890	77562	77854	78635	79312	80049	79634	79888	79948	
Wheat	23591	24385	26637	28702	26623	25565	24694	25076	25258	26827	27709	27924	27264	28092	29444	

Source: Rosstat

In the 2021/22 season, there was a reduction in grain production in the Russian Federation, despite the record winter sowing areas for the 2021 harvest. The autumn drought in 2020 led to exceptionally high mortality of winter crops in several regions. In addition, negative weather conditions in the summer period led to a reduction in crop yields and loss of crops in several regions of the Volga and the Urals. The yield of grain crops in the country decreased by 8% compared to last year and amounted to about 2.57 t/ha (2.78 t/ha a year earlier)., despite the negative weather conditions in several regions during different periods of the season, also approached the historical maximum of 2017 and amounted to 2.78 t/ha. Gross harvest, according to preliminary data from Rosstat, amounted to 120.7 million metric tons. (Appendix A)

In 2021, the sown area in the Russian Federation will be expanded by 600 thousand hectares and will amount to 80.5 million hectares. Of these, 51.5 million hectares are planned for spring sowing. 19.4 million hectares were sown with winter grains - an increase of about 1 million hectares compared to last year. According to experts, now about 80% of crops are in good and satisfactory condition. In 2020, 2.2 billion rubles were allocated for state support of agricultural insurance, in 2021 twice as much was provided - 4.4 billion rubles. This will make it possible to insure about 6.5 million hectares of crops (28% more than a year earlier). On April 9, 2021, in Russia, spring sowing was carried out on an area of 972.4 thousand hectares, or 1.9% of the forecast indicator (in 2020 - 4.5 million hectares). Spring grain crops in the country were sown on an area of 627.8 thousand hectares, or 2.1% of the forecast indicator (in 2020 - 3 million hectares). Wheat was sown on 13.7 thousand hectares, or 0.1% of the projected area (483.6 thousand hectares in 2020)

Table 11 Sowing areas of crops 2000-2020 in thousand hectares

	2000	2010	2018	2019	2020
Total sowing area	84 670	74 861	79 634	79 888	79 948
Cereals and leguminous crops including:	45 585	43 203	46 339	46 660	47 900
Winter cereals of which:	11 997	15 100	16 893	17 427	18 722
<b>Wheat</b>	<b>7 933</b>	<b>12 718</b>	<b>15 296</b>	<b>15 835</b>	<b>16 914</b>
Spring cereals and leguminous crops of which:	33 588	28 103	29 447	29 234	29 178
<b>Wheat</b>	<b>15 272</b>	<b>13 905</b>	<b>11 968</b>	<b>12 256</b>	<b>12 530</b>

Source: Rosstat

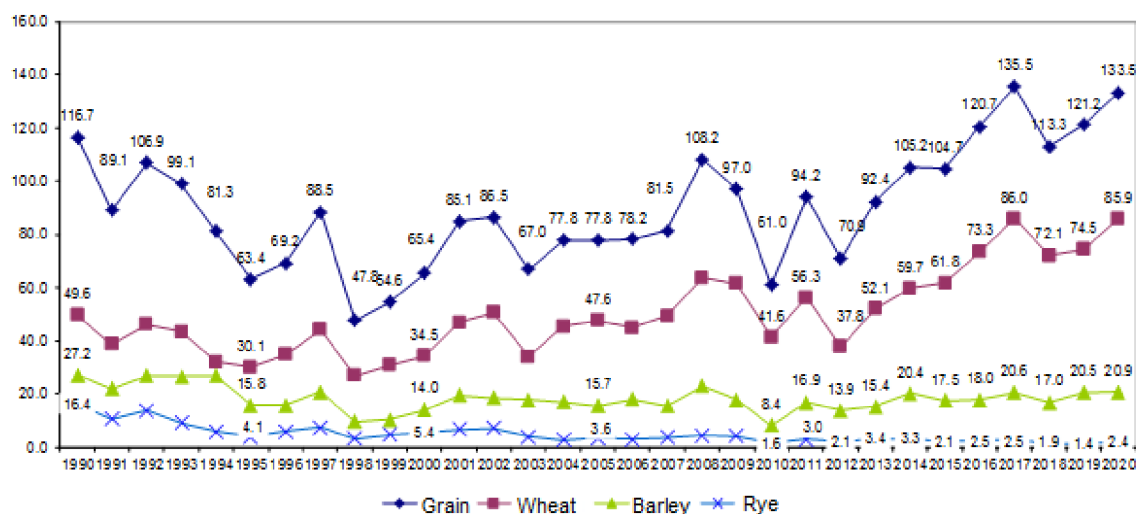
Every year over the past decade, Russia has been expanding the sown area for all grain crops. As we can see, the rate of expansion of sown areas for winter wheat is much higher than for spring wheat. Thus, since 2000, the planting area of winter wheat has increased by 8,981 thousand hectares; in 2000, spring wheat occupied 15,272 thousand hectares; by 2020, the area has decreased to 12,530 thousand, but compared to the previous two years, a positive development trend is observed. This situation with crops of different types of wheat arises from the fact that winter wheat brings much more grain than spring wheat and is more profitable for production, while spring wheat is superior in palatability. (Table 11)

The leading region for sowing wheat in 2020 was the Rostov region, where the sown area for this grain crop amounted to about 2.87 million hectares, which is 2.8% more than in the previous year. The second place is occupied by the Stavropol Territory, the region sowed more than 2 million hectares with wheat, which is 3.9% more than last year. The top three also includes the Altai Territory, which sowed 1.7 million hectares with a reduction in the area under wheat by 8.4% compared to last year. In the Orenburg region, 1.68 million hectares are allocated for wheat, which is 2.3% higher than last year. The Krasnodar Territory closes the top-5 leading regions in wheat sowing, where about 1.63 million hectares were sown, which is 5.1% higher than last year. In general, the sown area for wheat in 2020 exceeds last year's figure by 1.3 million hectares, amounting to 29.4 million hectares. This indicator is a record since the beginning of 2000.

### 4.3 Gross harvest

In 2019, the gross harvest of grain and leguminous crops increased by 7.9 million tons (7%) compared to the previous year, amounting to 121.2 million tons in Russia as a whole. The largest share in the structure of the gross grain harvest is occupied by wheat - 74.5 million tons in 2019, which is 3.2% more than a year earlier. Already on October 20, 2020, with a total gross grain harvest of 133,5 million tons, the wheat 87.5 million tons were produced. (Figure 9)

Figure 9 Gross harvest of grain and leguminous crops by types in Russia, million tons



Source: Rosstat

All indicators of wheat production approached the record levels of 2017, when its gross harvest amounted to 86 million tons. increase in production and productivity. As we can see from table 7, wheat occupies a leading position in the gross grain harvest. Winter wheat has a higher value than spring wheat, this is due to the fact that the sowing and sowing areas of winter wheat are much larger than that of spring wheat. Thus, the gross harvest of winter wheat in 2020 is three times more than spring. The growth rate of winter wheat for 2020 is 118.35% and spring wheat is 107.5%, which is slightly lower than winter wheat. However, in both cases, we observe a positive development trend, this is due to the fact that every year the size of sown areas for grain is increasing, as we noted earlier. (Table 12)

Table 12 Gross harvest of crop production in 2013-2020

	2013-2017(average per year)	2018	2019	2020
Cereals (weight after processing) including:	110,8	113,3	121,2	133,5
Winter wheat	46,4	52,9	53,4	63,2
Spring wheat	19,7	19,2	21,1	22,7

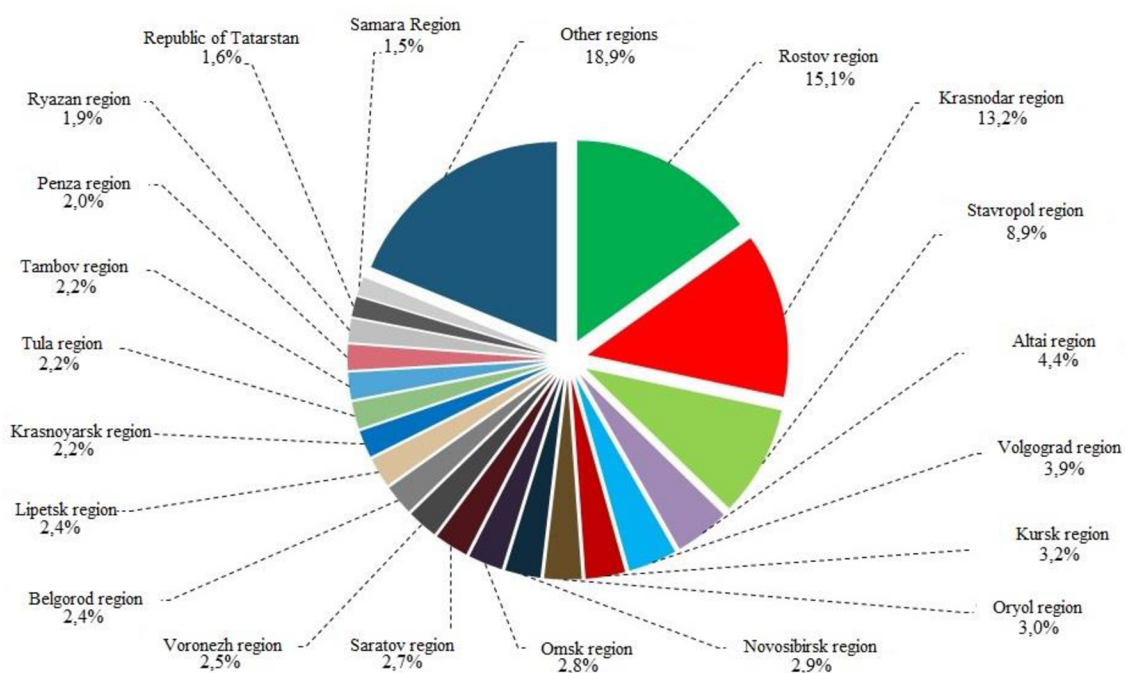
Source: Rosstat

In 2020, there was a second record gross harvest after 2017. The foundations for a high harvest-2020 were laid back in the fall of 2019, when the country experienced a record sowing of winter crops - 19.6 million hectares, of which winter wheat amounted to more than 17 million hectares (16.7 million hectares - in the fall of 2018). In particular, the area of winter wheat in the Southern Federal District increased by more than 200 thousand hectares and in the Central Federal District by 135 thousand hectares. However, due to several adverse weather events, the potential of the grain harvest in the south of the country was not fully realized. (Appendix B)

However, in 2021 the situation changed in a negative direction and the gross wheat harvest across Russia in 2021 amounted to 76.014 thousand tons, which is only 88% of the previous crop. In the south of the country, a combination of factors led to a rather significant reduction in winter wheat yields. Favorable weather conditions last autumn allowed many farms to sow it at an early date, and a mild winter with positive temperatures gave the plants the opportunity to actively develop and vegetate. But by spring, there was a shortage of productive moisture reserves in the soil, which is necessary for the further development of agricultural crops. Some of the plants that had already planted an ear lost it, although visually the fields looked quite safe and green. So, in districts of the Krasnodar and Stavropol Territories, as well as the Rostov Region, farmers reported the death of an ear in 20-30% of crops. The Volgograd region, which was less exposed to negative weather events among the regions of the south, was able to increase the collection per hectare by 20%. In general, the yield of all wheat in the Southern Federal District turned out to be 5% lower than in 2019. (Appendix B)

However, after the frosts in the south, the long-awaited and heavy rainfall began, which largely saved the harvest of spiked crops and contributed to the active growth of late crops in May-June. Nevertheless, the yield of winter wheat in the Krasnodar Territory decreased by 21% compared to last year, and in the Stavropol Territory - by 34%. The leading regions in 2021 are still the Southern Federal District and the Central Federal District. Although a positive increase is observed only in the southern federal district. Gross harvest in the Central Federal District decreased by 6880 thousand tons, the growth rate was 70,6%. In the southern federal district, the gross harvest increased by 2051,3 thousand tons, and the increase by 2020 amounted to 108,4%. It is especially worth noting the Volga Federal District, the growth rate in this region turned out to be the lowest of all other regions and amounted to 56,1%. In 2021, there were unfavorable weather conditions in this region, so the gross harvest decreased by 8544,9 thousand tons compared to 2020.

Figure 10 The share of the top 20 regions in the total volume of gross wheat harvest (spring and winter) in Russia in 2021, in percent



Source: Rosstat

In 2021, the TOP-5 producing regions accounted for 45.7% of all fees, the TOP-10 - 60.3%. The key regions for wheat cultivation in Russia (based on the TOP-10 regions in terms of



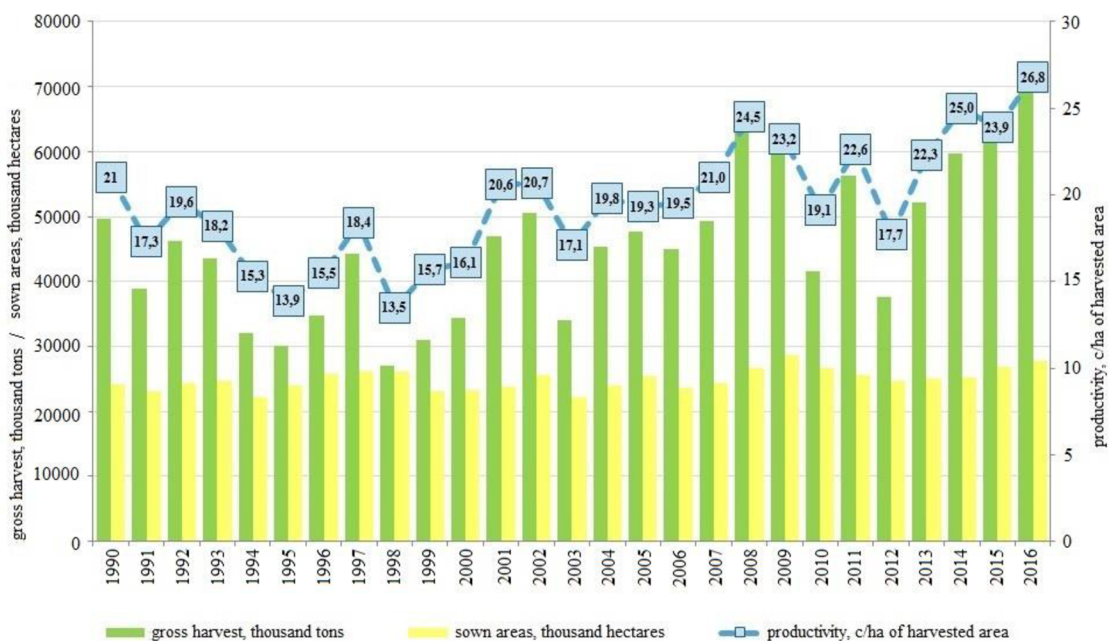
collections in 2021) are the Rostov Region, Krasnodar, Stavropol and Altai Territories, Volgograd, Kursk, Oryol, Novosibirsk, Omsk and Saratov Regions. (Figure 10)

#### 4.4 Productivity of land

In 2016, the wheat yield was at the level of 26.8 centners per hectare, which is 12.1% or 2.9 centners per hectare higher than the yield in 2015, over 5 years it increased by 18.6% or 4.2 centners/ha, over 10 years - by 37.4% or 7.3 c/ha, in relation to 1990 - by 27.6% or 5.8 c/ha. An analysis of average annual indicators over a long period makes it possible to largely exclude the influence of natural and climatic factors and determine the contribution of the use of advanced technologies to changes in wheat yields in Russia. (Figure 11)

The average annual yield of this main type of grain in Russia in 1991-2000. was 16.4 c/ha, in 2001-2010. - increased to 20.5 c/ha, in 2011-2016. - reached 23.1 c/ha. Thus, the trend towards a steady increase in yield is not accidental, it is stable, swept aside for several years.

Figure 11 Correlation of indicators of sown areas, yields and gross yields of wheat in Russia 1990-2016



Source: Rosstat

The highest wheat yield in 2016 was recorded in the Krasnodar Territory - 58.5 c/ha. For comparison, in 2015 it was 57.5 c/ha, in 2011 - 55.2 c/ha. In the Republic of Adygea, which is in second place in the ranking, in 2016 the wheat yield reached its maximum values in recent years - 51.4 centners / ha in 2015 - 49.2 centners / ha, in 2011 - 41.1 c/ha.

In the Belgorod region in 2016, the wheat yield was 44.9 c/ha, which is 19.1% or 7.2 c/ha more than in 2015 and by 32.8% or 11.1 c/ha higher than in 2011. The Stavropol Territory in 2016 occupies the 4th place in the ranking of regions with a yield of 42.8 c/ha. Over the year, it increased by 8.4% or 3.3 c/ha, over 5 years - by 10.3% or 4.0 c/ha. In the Kursk region in 2016, they collected 40.9 centners per hectare, in 2015 - 31.4 centners per hectare, in 2011 - 27.6 centners per hectare. The growth was 30.3% and 48.2% respectively.

The lowest yield in 2016 was observed in the Republic of Tyva (8.1 c/ha), the Republic of Sakha (Yakutia) - 9.1 c/ha, the Republic of Buryatia (9.7 c/ha), Perm Territory (10.5 c/ha). /ha), the Republic of Altai (11.2 c/ha), Jewish Autonomous Region (12.1 c/ha), Altai Territory (12.6 c/ha), Orenburg Region (12.6 c/ha), Zabaikalsky krai (12.8 c/ha), Khabarovsk krai (13.5 c/ha).

Table 13 Crop yields in the Russian federation 1990-2021

Grain yield, centner per hectare																
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Cereals and other crops	19,5	15,1	18,0	17,1	15,3	13,1	14,9	17,8	12,9	14,4	15,6	19,4	19,6	17,8	18,8	18,5
Wheat	21,0	17,3	19,6	18,2	15,3	13,9	15,5	18,4	13,5	15,7	16,1	20,6	20,7	17,1	19,8	19,3
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cereals and other crops	18,9	19,8	23,8	22,7	18,3	22,4	18,3	22,0	24,1	23,7	26,2	29,2	25,4	26,7	28,6	26,7
Wheat	19,5	21,0	24,5	23,2	19,1	22,6	17,7	22,3	25,0	23,9	26,8	31,2	27,2	27,0	29,8	27,2

Source: Rosstat

The average annual wheat yield in Russia in 1992-2001 was 16.7 c/ha, in 2002-2011. - increased to 20.7 c/ha, in 2012-2021. - reached 25.8 c/ha. Consequently, the trend towards increasing yields is not accidental, it is stable and has been noted for a several of years. (Table 13)

## 4.5 Wheat reserves

Grain harvesting begins in June-July and is primarily due to weather conditions. In the Southern and Central, Volga and North Caucasian districts, harvesting work is carried out earlier. They are followed by the North-Western regions, Siberia and the Far East. Winter wheat varieties ripen earlier, and therefore they are harvested earlier. In the South and East of Russia, harvesting can begin in June, if spring and summer were very warm. Behind them, suffering begins in other areas and can stretch until the first days of August - here everything is decided by climatic conditions. Spring wheat ripens 10–16 days later than winter wheat; accordingly, harvesting can be carried out from late June to late August. The first harvests begin in the southern regions and end in the northern ones.

Thus, as we can see, the largest accumulation of reserves for harvesting wheat from 2016 to 2021, except for 2017, falls on August, when the harvest of both varieties of wheat ends. In 2017, a record was set for the gross harvest, which is why the harvest continued until September, and at the end of the month, the reserves amounted to a record 24.4 thousand tons. This is the largest accumulation of wheat in the last 6 years. Otherwise, we can see a decreasing trend in storage from August - September to May - June of each year when it is expected to be replenished with a new crop.

Table 14 Wheat reserves in the Russian Federation 2016-2022, in agricultural organizations, tons

Indicators by month and year	2016	2017	2018	2019	2020	2021
January	8 697 240	10 685 058	13 178 934	8 701 874	9 685 877	11 538 533
February	7 268 974	9 215 785	11 084 252	7 229 129	8 227 547	10 081 543
March	5 868 798	7 477 124	8 890 942	5 971 608	6 169 424	8 495 486
April	4 188 299	5 836 778	6 737 296	4 643 530	4 227 319	6 609 013
May	2 590 475	3 882 020	4 625 862	3 153 074	2 756 674	4 804 992
June	2 916 905	2 590 642	6 159 131	6 391 791	3 720 175	3 701 527
July	16 165 425	14 954 750	16 309 122	16 711 771	17 259 888	18 635 457
August	21 296 196	22 950 719	19 918 444	20 398 738	23 794 168	23 113 158
September	21 262 260	24 439 484	18 608 217	19 738 101	22 878 872	21 417 832
October	18 340 693	21 976 929	16 534 756	16 789 607	19 363 056	19 604 740
November	15 612 947	19 130 485	13 521 891	13 959 937	16 418 972	16 826 269
December	12 206 743	15 051 552	10 193 642	11 078 600	13 402 755	13 854 134

Source: Fedstat

By February 1, 2021, wheat stocks in agricultural organizations amounted to 11.54 million tons (+1.85 million tons, or +19.1%) and also reached a three-year maximum. (Table 14) The highest stocks of grain in general and wheat in particular in agricultural organizations are in the Central Federal District: 8.25 million tons and 4.49 million tons, respectively. In the same district, the largest absolute increase in stocks of all grain and wheat was recorded compared to the level of the previous year (+2.25 million tons and +1.90 million tons).

In the Volga Federal District, stocks of total grain and wheat increased by 0.72 million tons and 0.70 million tons, respectively. In other districts, grain stocks have decreased compared to 2020 levels. The maximum decline in stocks of grain and wheat was recorded in the Southern Federal District (-0.60 million tons and -0.46 million tons, respectively). In the North Caucasus Federal District, the Urals Federal District and the Siberian Federal District, grain reserves decreased by 0.29 million tons, 0.25 million tons and 0.16 million tons, respectively.

By February 1, 2021, 49.5% of wheat in agricultural organizations in Russia (without small ones) accounted for ten regions: two southern regions (Krasnodar and Stavropol Territories), six regions of the Central Federal District (Lipetsk, Belgorod, Kursk, Tambov, Voronezh and Oryol regions), as well as the Krasnoyarsk Territory and Tatarstan. The largest stocks of grain in this group of enterprises are stored in the farms of the Lipetsk region (675 thousand tons, or 2.44 times more than on February 1, 2020). The Krasnodar Territory fell to second place (672 thousand tons, 18.8% less). The Belgorod Region moved up to third (656 thousand tons, +86.0%), which displaced the Stavropol Territory to fourth position (637 thousand tons, -26.8%). In total, wheat stocks in the North Caucasus decreased by 776 thousand tons (-31.3%) compared to last year, and their share in the total Russian stocks fell to 14.8% .

Stocks of food wheat in procurement and processing organizations amounted to almost 6.5 million tons and decreased by 687 thousand tons (by 9.6%). Due to the sale of grain from the GIF, commercial stocks of food wheat in the procurement and processing organizations of Russia increased by 902 thousand tons (by 16.5%) by January 1 compared to 2020 (by 16.5%) and reached 6.37 million tons.

The highest stocks of grain in general in procurement and processing organizations are in the Central Federal District (3.53 million tons, or -7.4%, compared to 2020), wheat - in the

Southern Federal District (2.72 million tons, or +1.3%. Most of all, wheat stocks increased in the Volga region (by 493 thousand tons, or by 37.0%). The largest decrease in wheat stocks was registered in the Siberian Federal District (by 683 thousand tons, or by 34.8%) and the North Caucasus Federal District (by 244 thousand tons, or by 43.6%).

By January 1, almost 62.1% of food wheat in the procurement and processing organizations of Russia accounted for ten regions: three southern (Krasnodar and Stavropol Territories, Rostov Region), three Siberian (Altai Territory, Novosibirsk and Omsk Regions), as well as to the Volgograd, Kursk and Orenburg regions, St. Petersburg. The largest stocks of grain in this group of enterprises are still kept by the harvesters and processors of the Krasnodar Territory (1,166 thousand tons, which is 14.0% less than on January 1, 2020). The Rostov region remained in second place (731 thousand tons, +36.6%), the Volgograd region came in third (314 thousand tons, +27.7%).

## **4.6 Prices**

Wheat markets tend to decline from spring to the July harvest and then start to rise from those lows in the fall and winter. All grain markets follow a regular planting and harvesting cycle, regardless of weather conditions.

Old crop prices remain high until new crop prospects are known. Therefore, prices rise as supply approaches its lowest level in the current year. In the months of the old harvest, when supply is usually lower, grain prices are higher than in the more remote months of trading in the new crop. When a new crop is harvested, a higher supply level reappears. As a result, many grain markets reflect the lowest seasonal prices during the new crop trading month. Prices pick up quickly after harvest until September. Prices remain above summer harvest from September until the end of the year. The price minimum forms in the period end June-beginning of July, while the price peak is formed in the period end February-mid-March.

The price of grain is affected by:

### 1. Weather

- Hot and dry climate. If the weather was dry and hot, then the harvest will be faster. A climate that is too dry makes it impossible to successfully grow 2 crops per year, which makes it even more important that the only crop is harvested efficiently.

- Humid climate

## 2. Harvest

- The size of the offer is influenced by expectations and the fact of the market in terms of the size of the harvested crop. Serious delays in planting can reduce the area under crops, then there will be less harvest and reduced supply. For example, planned areas may not be planted due to too wet weather conditions.

## 3. The amount of grain stocks in storage

- World stocks are growing and are high or in excess - this leads to an overload of storage facilities and a decrease in the cost of grain.

- Stocks are falling - premises are empty, prices remain high or continue to rise.

- More off-farm storage - less space. As occupancy increases, supply and demand increase the cost of storage.

- The cost of fertilizers.

## 4. Fertilizers are on the rise – agricultural commodities have potential to grow

Fertilizers are falling - agricultural commodities have the potential to fall

- Raw materials affecting fertilizer prices.

Rising natural gas prices lead to a widespread reduction in ammonia production or higher prices for ammonia, which is a feedstock for nitrogen fertilizers.

Rising prices for ammonia and sulfur - leads to an increase in prices for phosphate fertilizers.

## 5. Outbreaks of viruses and diseases

We can see the dependence of average producer prices on the regions that are leaders in wheat harvests. The main 5 grain harvesting regions and their average producers' prices before new crop harvest with minimum stock availability in June are the Rostov Region – 13 824 rub/ton, Krasnodar – 15 208 rub/ton, Stavropol – 14 251 rub/ton and Altai Territories – 13 874 rub/ton, Volgograd – 12 787 rub/ton, Kursk – 13 653 rub/ton, Oryol – 13504 rub/ton, Novosibirsk – 13 287 rub/ton, Omsk – 15 947 rub/ton and Saratov Regions – 12 675 rub/ton. The most expensive wheat for all periods of 2021 is grain in Chelyabinsk. This is due to the fact that in this area, mainly durum wheat is grown, the cultivation of which is much more problematic than the others. The price is also affected by the decrease in sown areas for the last 3 years and the cultivation of wheat in not so large areas. For comparison, the sown area in Chelyabinsk for 2021 is 1328.6 thousand hectares, while in the top 5 leading region of gross harvesting of wheat with the most expensive cost in Omsk, the sown area is

1997.7 thousand hectares, which is 50, 36% more than in the Chelyabisk region. A dry summer and an increase in the cost of processing and transporting grain also caused a rise in prices. (Appendix C)

If we consider the South Ural Federal District as a whole, then in the months before the ripening of a new crop, prices are relatively comparable with other regions, however, in December, after filling the storehouses and the seasonal rise in grain prices, we also observe the highest value among all regions, which is 18 623 rubles per ton.

There are regions in which wheat is practically not grown because there are large cities such as Moscow or regions in which climatic conditions simply do not allow growing grain, such as Yakutia. In this regard, we observe the correlation between the price and the amount of wheat produced there. Low prices are due to the small number of sown areas and gross harvest from the fields. The lowest producer price for sold wheat in March before the start of the new harvest is in Moscow and is 8 142 rubles per ton. And among all regions for the whole of 2021, the cheapest price for wheat is in Far Eastern Federal District.

Since September 2021, there has been an increase in wheat prices. This is largely due to the strengthening of world grain prices, as well as the reduction in the gross harvest of wheat in Russia in 2021 compared to 2020. For this reason, producer prices began to rise from September, and at the end of December, one ton of grain in average all over in Russia costs 15,133 rubles, which is 6.77% more than in September after a seasonal price increase.

#### **4.6.1 Price regulation of the market**

The most important instrument for regulating the grain market in Russia is government procurement and commodity interventions. The tasks and principles of organizing interventions are established by Art. 14 of the Federal Law of December 29, 2006 No. 264-FZ "On the Development of Agriculture", and the procedure for carrying out - by Decree of the Government of the Russian Federation of October 5, 2016 No. 1003. When market prices fall below the minimum settlement prices, the state purchases grain from agricultural producers into the intervention fund, if the maximum prices are exceeded, he sells it. The minimum and maximum prices are set at the beginning of the year by the Ministry of Agriculture of Russia. The first price is needed to protect the interests of grain producers,

the second - its consumers. The law provides for procurement and commodity interventions for food and fodder wheat, fodder barley, rye and corn. During the period of procurement interventions, grain imports may be limited, and during the period of commodity interventions, exports may be limited.

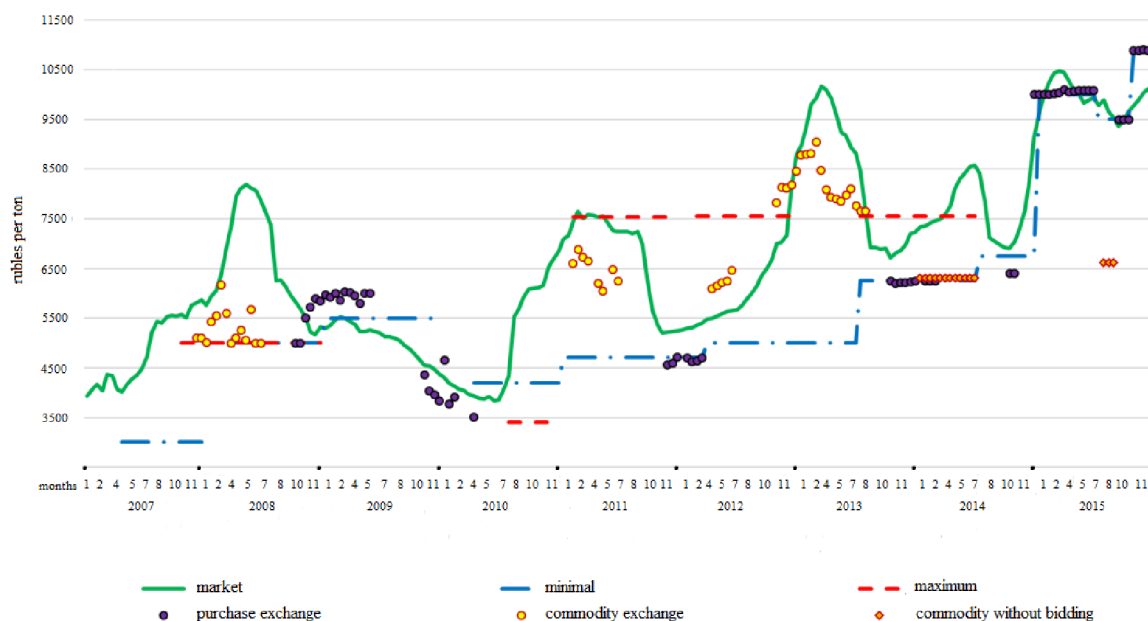
Let us analyze the practice of state regulation of the grain market. The practice analysis was carried out for the period 2007-2015. The initial data for the analysis are grain prices: market prices, minimum and maximum prices approved by orders of the Ministry of Agriculture of the Russian Federation, exchange prices of purchase and commodity interventions (by trading days or average for half a month), prices approved by the Government of the Russian Federation or determined by other means commodity interventions conducted without bidding.

To determine the gain or loss of agricultural producers from the purchase and commodity interventions, the difference between the cost of products at market prices and at actual intervention prices was calculated. The effectiveness of interventions for the state was determined by federal budget expenditures on payments to the Agent for procurement and commodity interventions, compensation for interest on loans, storage and compensation for grain losses during storage, as well as budget revenues from commodity interventions.

The effectiveness of participation in the regulation of the grain market for the Agent was determined according to its annual reports in terms of the costs of intervention and storage of grain, payment of interest on loans and proceeds from the sale of grain from the intervention fund. (Figure 12)



Figure 12 Prices for the 3-class wheat, thousand rubles per ton



Source: Made by author from Minselhoz data

The assessment of state regulation of the market was carried out according to the following parameters.

*Establishing a price band.* The state intended to keep prices within the established corridor - not lower than the minimum and not higher than the maximum. As can be seen from the figures, in fact, this corridor was not marked by the regulator. Neither producers nor consumers were informed about it.

In April 2007, a minimum price of 3,000 rubles was set for grade 3 wheat. per ton. The market price was above the maximum. The maximum price at that time was unknown, it was set only at the end of October - 5 thousand rubles. per ton. The market price at that time had already exceeded 5.5 thousand rubles, i.e., the ceiling was exceeded before it was set. Commodity interventions began in November, but the market price continued to rise, and by April 2008 it had exceeded 8,000 rubles. per ton. In March 2010, a minimum price of 4.2 thousand rubles was set. per ton, and in June of the same year - the maximum price of 3.4 thousand rubles. below the minimum. We can talk about a clear price corridor in 2011-2014. During this period, the maximum price was kept at the level of 7.5 thousand rubles. per ton,

and the minimum is 4.7-6.3 thousand rubles. Market prices were within the designated corridor for almost the entire period.

When did the interventions start? Legally, interventions should begin after market prices go beyond the price band. But in fact, they very often began before the market price crossed the market price thresholds. For wheat, commodity interventions were only twice carried out after the market price crossed the established threshold prices, and in six cases this requirement was violated. For all crops, procurement interventions were carried out not during the harvest, but at the end of the year, when agricultural producers had already sold the bulk of the crop.

The regulator typically began buying interventions for Grade 3 wheat, rye, barley and corn when the market price fell sharply. Commodity interventions began in the opposite situation, when the price rose sharply. It is not known what the regulator was guided by for wheat of the 4th and 5th grades, since there was no monitoring of prices.

Purchasing interventions were almost always carried out at a price close to the approved minimum. The exception is the purchase interventions for wheat in late 2008 - early 2009, when purchases were made at prices significantly higher than the minimum. As for commodity interventions, the picture is different: very often sales were carried out at prices significantly lower than the maximum.

This rule was especially grossly violated in cases where the sale was carried out without exchange trading. By selling grain below the approved maximum, and in many cases significantly below the minimum prices, the state contributed to the destabilization and infringement of the interests of grain producers.

For comparison, let's give a brief overview of the grain market regulation features in two of the three largest economies in the world - the US and the EU, which approaches Russia in terms of natural and climatic conditions of grain production.

### USA

Processes in the market are faster and more efficient if they are handled by a specialized structure - a department or a service. In the United States, to ensure compliance with legislation at different levels and times of adoption, there is a special department in the Department of Agriculture - the National Agricultural Law Center (National Agricultural Law Center). The gaps in legislation and the layering of institutions typical of Russia could

have been avoided if there had been an institution directly responsible for the legal order in the processes on the grain market. Another example is the Department of Rural Development. This department is responsible for the development of infrastructures in the regions, including the Internet and roads, which allows farmers to be informed about ongoing activities faster and contributes to the improvement of the market environment from both a competitive and social point of view.

Affordable insurance and income support for farmers. In the US, the government covers up to 65% of the cost of crop insurance from the budget. The minimum levels of income for farmers at which the farm can exist are calculated, and support is provided if the income is lower. There is a system of insurance programs through which a farmer can collect a suitable insurance package. The farmer can insure the total income, or income from specific grains, or crop tonnage. A wide range of opportunities to protect against bankruptcy in the event of a crop failure or low prices reduces the risks of farms, which makes them more sustainable over time, saving them from decay.

The grain-secured loan system, followed by the right to repay the loan in cash or grain, is another system that allows U.S. farmers to increase the liquidity of their grain crop. It allows the farmer to quickly exchange grain for money and reduce the risk of insolvency.

The United States does not provide for the priority of supporting the welfare of farmers over the welfare of consumers of final goods, or vice versa, therefore, the goals of government programs simultaneously include maintaining farmers' incomes and increasing the availability of food for the population.

### European Union

The competitiveness of European grain is achieved through high direct payments. This mechanism can be applied in Russia. Its foundations are laid in the current State Program (2013-2020). At the same time, the current mechanism of Russian payments - apart from their obviously insufficient size, which makes the whole idea meaningless - refers to the measures of the yellow box, the volume of which is limited after Russia joins the WTO. This attribution is valid in terms of the mechanism for providing support, despite its official definition as "unrelated" support. At the same time, the intensification of work in the country to involve unused lands in the cultivation, the potential for strengthening the national currency increase the risks of exceeding the set limit. In this regard, the experience of the

EU on direct payments per hectare, excluding current agricultural production, would be useful for changing the Russian mechanism for direct payments.

The EU legislation, like the Russian one, provides for the possibility of purchasing and commodity interventions in the grain market. When calculating the level of the intervention price, EU regulators proceed from the fact that it is not a market price: only in some years it approaches the market price, most often it remains significantly lower. In Russian practice, the intervention price is close to the market one. During periods of a large gap between the domestic and foreign price, it is adjusted with a focus on external prices. In this regard, within the framework of improving the mechanism for regulating the grain market, it is required to develop a mechanism for determining the intervention price.

#### **4.7 Export and Import**

Since the 40s years of the 19th century, with the growth of the population of Europe, its demand for bread has grown, which, among other exporters, was satisfied by Russia. During the 19th century, the population of the Old World (excluding Russia) almost doubled: from 147.8 million people. to 287.6 million people, while in the previous century only by 46.5%. During the period of the Second Industrial Revolution, the average annual grain export from Russia also almost doubled: from 6.5 million tons to 11 million tons. (41, p.15)

At the same time, the share of Russia in world trade in the four main grain crops (rye, barley, oats and corn) decreased from 38% in 1893-97. to 22.1% in 1913. Nevertheless, Russia at that moment ranked first in terms of grain exports, slightly ahead of Argentina (21.3%)

At the end of the 19th - beginning of the 20th century, Russia lost several key markets: the English market - the USA, the rye market - Germany, where the country began to meet the needs on its own, and even captured the grain markets of Russian regions: Finland and several western provinces. (41, p.32)

The export grain of Russia was of poor quality, contained a significant number of impurities, and there were no uniform standards for grain varieties in the country.

By the end of the 1920s, the USSR regained the status of a raw material exporter, which the Russian Empire had previously possessed. In the early years of the development of the grain market, international banking capital made wheat one of the main sources of covering the

USSR's import obligations. In the early 1930s, grain exports began to constitute a significant item of the country's foreign exchange income, ranking first with an indicator of about 20% in 1930-1931: in 1929, its share was 9.9%, in 1930 - 29, 0%, in 1931 - 32.1% and in 1932 - 20.7%

In May 1931, the Soviet delegation, at the invitation of the Canadian side, took part in the wheat exporting countries conference in London, which discussed the fall in prices and the export crisis. The accumulated surplus of exporting countries on February 20, 1931, amounted to about 20 million tons, with an estimated export before the end of the year in the amount of another 10 million tons. by 35%, and since 1929 - twice. In 1932, compared to the price of 1928-29, they paid 37.7% for wheat, 77.2% for rye, 61% for barley, 83.4% for oats, 42.9% for corn, and 28.6% for oilcake. %, legumes - 28.6%, seeds and others - 14.5% The Soviet Union began to regain its place in the world grain market in the context of the Great Depression in Western countries, falling demand and prices, as well as tougher competition with traditional grain producers. In 1930, a record harvest was obtained, which allowed a sharp increase in exports. wheat was one of the main sources of covering the obligations of the USSR on imports, was dictated by the exclusive financial regime established by international banking capital for the Soviet Union. Operations with bread made it possible to receive currency as quickly as possible on bail and within the limits of actual exports, including against commodity stocks concentrated in the ports of the USSR. The amount of these loans usually reached 1.25 million pounds (11.8 million rubles). The most tense was the second quarter of the following year, when the volume of exports simultaneously decreased, and the loans received at the beginning of the campaign had to be repaid.

The procedure for transferring grain for export was described in documents as “shipping for export” and consisted in transferring the product from the Procurement Committee under the Council of Labor and Defense (since 1933 - under the Council of People's Commissars) of the USSR to the People's Commissariat of Foreign Trade. However, such a transfer was not irrevocable: depending on the situation, the People's Commissariat of Foreign Trade could ship the grain back to the Procurement Committee.

In the post-war years, the USSR was a grain exporter, significantly inferior in this indicator to the North American states (USA and Canada), which collectively exported an average of

about 20 million tons of wheat. At the same time, the climatic conditions for growing cereals in Russia have not improved, and the yield is inferior to the world average: 22-27 centners per hectare against 31 centners. (Table 15)

Table 15 Export of grain from the USSR, thousand tons

Grain	1955	1956	1957	1958	1959	1960
Wheat	2 035.8	1 452.4	5 450.8	3 878.7	6 052.0	5 638.9

Source: Rosstat

As of the beginning of 2010, Russia was in 3rd place in the world in grain exports (after the US and the EU) and in 4th place in the world in wheat exports (after the US, EU and Canada). Over 10 years, Russia has become a solid leader among wheat exporters (35 million tons in 2019/20), ahead of the EU (32 million tons), the USA (27.5 million tons), Canada (23 million tons), Ukraine (20 .5 million tons). The total volume of the grain trade market amounted to 184 million tons (an increase of 30 million tons or 20% during 2011-2019).

In the same season, Russia showed the highest growth in exports (+37%), yielding in this indicator to Argentina (+54%), but ahead of the United States (+26%). Since 2005, Russian wheat production has become export-oriented: the country grows a larger share of the crop for export than the world average. In terms of export efficiency (revenue per ton), Russia is significantly inferior to the United States and Canada, which sell their grain at almost half the price (335 and 229 dollars per ton, respectively, against 232 in 2014).

In the overall structure of food exports by Russia, the largest share by 2016 fell on wheat - 27.7% of the total volume. In 2014, for the first time, income from grain exports brought the country more revenue than from the supply of Russian weapons: \$18.9 billion against \$13.2 billion, respectively.

At the end of 2018, the Russian Federation took first place in the world in grain exports (the last time this happened in 2016), overtaking its main competitor, the United States. Wheat exports are statistically recorded, however, not by calendar years (January-December), but by the so-called agricultural years - for example, the last agricultural year began in July 2017 and ended in June 2018.

In the 2017 Russia collected a record harvest of 135.4 million tons of grain. From January to December 2018 (usual), almost 44 million tons of wheat were exported. Although several media immediately made statements that “compared to the previous year, foreign supplies have doubled,” in reality they increased by 33%

Against this background, the American business press last year began to write about the ruin of local companies, which is connected not so much with the harvest in Russia and the increase in export deliveries from Russian regions, but with the ongoing US trade war with China and other countries, as well as with the introduction of duties (The Chinese imposed a 25% tariff on US wheat). By December 2018, the volume of grain reserves in Russia was estimated at 42.4 million tons, which was 19.4% less than in 2017.

Despite this, from the beginning of the 2018-2019 agricultural year (which started, recall, in July) and until December 27, 2018, Russia increased grain exports by 5.1% (from 26.9 million tons to 28.2 million tons). Wheat showed even greater dynamics, the export of which increased by 13.7%, to 23.8 million tons. Nevertheless, due to the smaller harvest, the mark of 40 million tons (by the way, a record by world standards) this year is unlikely to be overcome.

In 2017, a record was also set when Russia exported 33 million tons of wheat - over the past 25 years, the United States had more significant achievements in 1993 (35.7 million tons) and in 2013 (33.1 million tons).

In 2018, Russia also won a record share of the world market for the sale of wheat: from 2002 to 2015 it varied in the range of 6.6-6.8% (the best achievement was in 2007), but in 2018 it was already 23%. However, due to a smaller harvest and a decrease in exports this year, experts believe, the share of the Russian Federation will decrease to 19%.

At the same time, Russian exporters have improved the quality of the wheat they sell. The main share of exported grain in recent years is wheat of the 3rd class (26% in 2016 and 12% in 2017) and wheat of the 4th class (73% in 2016 and 84% in 2017). Wheat of low quality is supplied to countries with low requirements, such as Bangladesh. This country ranks 6th in terms of imports of Russian wheat in 2018 (1.8 million tons of grain were exported there). Wheat of a higher quality, but still of the 4th grade, is supplied to Egypt (in 2018, the country became the leader in the import of Russian grain, having purchased it in the amount of 9.5

million tons). But Russian wheat of the 4th class is superior to similar goods from other countries. The price became a separate competitive advantage when the ruble collapsed against the dollar in 2014, as a result of which Russia in the same Egyptian market pressed France and Romania.

In just 4 years, Russia doubled wheat exports (in 2014, exports amounted to only 22 million tons of grain), which was not prevented by a decrease in supplies abroad in the crisis year of 2015 by 4%, to 21.2 million tons of grain.

At the same time, the Rostov region, which remains the main exporting region for the third year in a row, increased wheat exports almost four times over the same 4 years: from 4.5 million tons to 17.7 million tons (\$3.4 billion), which amounted to 40.3 % of all Russian wheat exports. Last year, the export of Rostov wheat increased 1.5 times. This is due to the breakthrough of the local company Rif, which in recent years has become the largest Russian exporter of wheat.

Three regions, including Moscow, account for 82% of all wheat exports of the Russian Federation, the once leading Krasnodar Territory, the "breadbasket of the country" (in 2014, the region's exports amounted to 5.7 million tons, and Rostov - 4.5 million tons), very suffered greatly in the crisis year of 2015. Despite a record wheat harvest (almost 10 million tons), exports fell by 40% to 3.5 million tons. Rostov then increased it by 1.45 times, to 6.6 million tons, ahead of even Moscow, a city where wheat exporters who own grain fields in the Kuban or in the Rostov region like to register. For this reason, it is not possible to accurately distinguish whose grain the Moscow exporters sell.

Along with Moscow, the cities and regions that do not grow wheat, but occupy the first lines in terms of exports, include St. Petersburg and the Kaliningrad region. The latter should rather be called even re-exporters - some of the sellers, given their proximity to the border, can simply resell Russian grain.

One way or another, the export share of the Kuban in 2015 decreased from 26.2% (at Rostov then it was 20.7%) to 16.5%, and only in the last two years, Krasnodar sellers managed to increase it to 19.8%. Since 2014, the volume of Kuban wheat exports has increased one and a half times.



Due to the Rostov success, the share of Moscow exporters decreased from 37% to 21.8%. Indeed, since 2014, Moscow's wheat exports have increased by only 17.4%, while last year its volume grew by only 7.7%. For comparison, Rostov increased sales, we recall, one and a half times, Kuban - by 40.8%. As a result, in 2018 Moscow sold 9.6 million tons (\$1.8 billion) abroad, only 1 million tons more grain than the Krasnodar Territory. But in dollars, Kuban wheat is more expensive - 1.7 million tons worth \$1.7 billion were exported.

The three main exporting regions thus account for 82% of all Russian wheat exports. Or 7 billion rubles from all Russian exports in 2018 (\$8.4 billion).

The top five exporters also include the Voronezh region and St. Petersburg. Voronezh almost tripled wheat exports over 4 years - from 547.3 thousand tons to 1.6 million tons (wheat of the worst quality, in value terms it was sold for \$ 312.4 million) and was able to win back two lines, moving from sixth to fourth place. The region's share in exports increased from 2.5% to 3.6%.

While the share of St. Petersburg increased by 2017 from 3.3 to almost 4%, then the volume of wheat sold by St. Petersburg companies abroad amounted to 1.3 million tons. But in 2018, sales here fell by 14%, to 1.1 million tons (\$218 million). It is unlikely that this is due to any European sanctions, because the re-exporters of the Kaliningrad region increased their sales last year (mainly, obviously, to Latvia, Lithuania and Germany) by one and a half times, to 1 million tons of wheat (the share increased to 2.5%, \$197.6 million). Thus, over 4 years, the volume of Kaliningrad exports increased by 2.3 times.

Against this background, the decrease in the share of wheat exports from the Stavropol Territory (from 3.8% in 2014 to 1% in 2018) looks especially interesting due to a halving of the volume of grain sold abroad: from 846.5 thousand tons to 441 .2 thousand (total \$79.1 million). This is at least strange for one of the largest grain producers in the Russian Federation, especially since the regional authorities regularly report on the growth of grain exports (without specifying, however, which one). In 2018, it approached, for example, 5 million tons, and, obviously, wheat made up a small share there.

This can also be explained by the “flow” of exporting companies to the neighboring Krasnodar Territory and Rostov Region. So, in the Ministry of Agriculture of the Stavropol Territory, speaking of domestic transportation of all grain with subsequent export, they

declare a volume of almost 3 million tons shipped to the ports of Krasnodar Territory, Rostov and Astrakhan regions and Dagestan.

All above regions cover more than 90% of all Russian exports, the rest deliver very little abroad. In the Volga Federal District, the largest volumes are in the Saratov and Orenburg regions: 270 thousand tons and 227.7 thousand tons, respectively (for two, this, however, is slightly more than 1% of the market). But it is worth noting that earlier these deliveries were generally almost imperceptible in the total volume: over 4 years, the export of Saratov wheat increased by 4.3 times (in 2014, only 62 thousand tons were exported), and Orenburg - by a record nine times from 25 thousand tons.

Tatarstan in 2014 and 2016 did not export wheat at all, and in 2017-2018. its share did not exceed 0.08% of all Russian exports: last year, 36.5 thousand tons of wheat were sold abroad, which is 2.8 times more than a year earlier (12.8 thousand tons).

If we talk about the export supplies of Russian wheat in value terms, then, of course, they partially differ (including depending on the quality of the exported wheat, see above). For example, if in 2015 wheat sales abroad fell by only 4%, in value terms, exporters' revenues fell by almost 30% - from \$5.4 billion to \$3.9 billion, which is explained by the collapse of the Russian currency against the US dollar. As a result, the growth of Russian grain exports in value terms over 4 years was not 200% (as in terms of volume), but only 155.8%.

Recently, however, Russian producers have been helped not only by the increase in exports, but also by the favorable price situation in world markets. In December 2018, export prices for Russian wheat rose by \$4 to \$238 per ton, the highest since December 2014. Back in October of the same year, wheat cost \$229 per ton. This, of course, still cannot be compared with the successful years for Russian exports in 2007 and 2012, when the price of wheat rose to \$250 per ton, and then to \$270, falling to almost \$150 by 2016, after which it began to rise again.

At the same time, this could hit grain exports hard - expensive Russian wheat is no longer competitive on world markets. Producers, or rather sellers, can only hope for a reverse trend, especially since in February it became known that export prices for wheat had stopped growing at \$249.5 per ton: it was noted that "with such quotations, there is no demand for

grain from Russia, and exporters cannot reduce prices due to the high cost of wheat in the domestic market.”

We also note that the high export price was directly reflected in the price of wheat (and hence flour and bread) in the domestic Russian market in almost all regions of the country in 2018. Exporters' pursuit of the big jackpot in foreign markets made sales in the domestic market unprofitable. This led to an increase in prices in the regions of the Russian Federation.

Sellers and experts themselves call Russia's main interest in the world wheat market today not China, but Southeast Asia the markets of India, Sri Lanka, the Philippines, and especially Indonesia (a contender for the title of the main buyer of grain on the world market). Let's note right away that so far nothing is coming out of India: if in 2016-2017, 51 thousand and 383.2 thousand Russian wheat were delivered there, respectively, then in 2018 this country did not purchase any wheat from Russia at all. However, last fall, the Ministry of Agriculture of the Russian Federation announced that Russia and India were negotiating and preparing to increase the export of grain and livestock products to the subcontinent.

In 2017, Indonesia accounted for 3.6% of Russian wheat exports, or 1.18 million tons, according to Russian customs data. The leaders were Egypt (7.8 million tons - 23.7%), Turkey (3.4 million tons - 10.4% of total exports) and Bangladesh (2 million tons - 5.8%). Following were Sudan, Yemen, Nigeria, Azerbaijan. In 2018, Indonesia has already bought 1.3 million tons of Russian wheat, moving to seventh place.

Vietnam increased the supply of Russian grain by 2.6 times, immediately taking third place (purchasing 2.4 million tons for \$459.2 million), and in the fall of last year, it threatened to completely abandon the import of wheat from the Russian Federation due to the discovery of Russian wheat of a quarantine object for this country - a field plant. In addition to Vietnam, Russian wheat producers and sellers received complaints about the quality and safety of grain from Indonesia, Vietnam and African countries.

Philippines - increased purchases of Russian wheat in 2018 by almost seven times: from 155.6 thousand tons to 1 million tons (\$192.8 million). We also note that back in 2015, wheat was not supplied to this country at all, and in 2014 and 2016, supplies were small (51.7 thousand and 16.5 thousand tons), a sharp increase in imports occurred in the last 2 of the year. Since 2014, shipments to the Philippines have increased 10 times. The situation is

similar with Vietnam (zero sales in 2015 and small sales in 2014 and 2016): over 4 years, imports of Russian wheat there increased by 18 times.

Imports of Russian wheat in Latvia doubled in 4 years: from 545.9 thousand to 1.2 million tons (\$221 million), Mexico almost tripled its imports - from 366.3 thousand to almost 1 million tons (\$185.7 million). Deliveries to Bangladesh decreased by 3.2% to 1.8 million tons. Although this country remains in the top 10 largest importers of Russian wheat: from 2014 to 2018, imports of Russian wheat to Bangladesh increased by 9.5 times.

However, half of all Russian wheat in 2018 was sold to five countries. Egypt retained its leadership, increasing imports by 22% to 9.5 million tons (\$1.8 billion), while Turkey retained second place, having bought almost 5 million tons for \$926.5 million. Sudan is also among the top five importers (2.2 million tons for \$417.3 million) and Nigeria (1.9 million tons for \$403.6 million).

Western Europe, except for the Baltic three, purchases very insignificant volumes due to sanctions. Most of it falls on Greece (310.2 thousand tons), Spain (176.4 thousand), Romania (156.2 thousand) and Switzerland (153 thousand), which is incomparable with supplies to African, Asian countries and countries Middle East. Israel last year bought, for example, 760.2 thousand tons of Russian wheat. And in general, for 4 years, we increased the import of our grain by one and a half times.

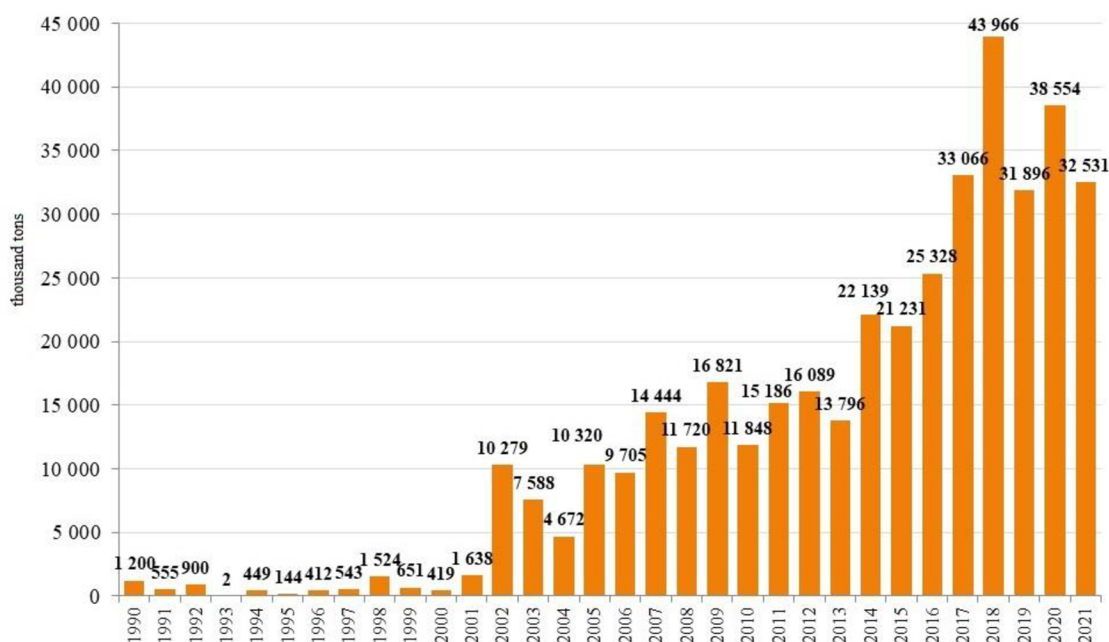
Imports of wheat and meslin in 2020 decreased by 0.9% to 189.9 thousand tons. In value terms, imports grew by 33.3% to \$64.8 million. Russian grain was supplied to 138 countries of the world in 2020, and Turkey, Egypt, Iran, Saudi Arabia, China, Bangladesh, and Kazakhstan were the main buyers.

Turkey was a key importer and purchased about 11.3 million tons of grain products in 2020. This is the highest figure for the supply of grain to Turkey for the entire time of shipments of products from Russia.

Saudi Arabia bought 3.2 million tons of grain crops from Russia, which is 2.5 times higher than last year. Basically, the increase in exports was due to an increase in barley supplies. Grain exports to China for the year exceeded 1.88 million tons, which is 11% higher than in 2019.

In relation to the level of 2020, the volume of exports to other countries decreased by 15.6% to 32,531 thousand tons. The decrease in export deliveries in 2021 was mainly affected by a decrease in wheat production, as well as an increase in export duties in the last quarter of the year. (Figure 13)

Figure 13 Dynamics of wheat export from Russia from 1990-2021, thousand tons



Source: Federal Customs Service (customs.gov.ru)

In general, when considering long-term trends, in recent years, wheat exports from the Russian Federation have increased significantly. In 1990-2001 annual export did not exceed 2 million tons, in 2002-2006. deliveries, depending on the specific year, ranged from 4 to 10 million tons, in 2007-2013. it was 12-17 million tons, in 2014-2016. - 21-25 million tons, in 2017-2021 - 32-44 million tons. The expansion of export supplies was facilitated by the development of logistics, export infrastructure, as well as an increase in world demand for wheat.

According to Rosstat database, Egypt, Turkey, and Bangladesh bought more than half of Russia's wheat. Egypt is the world's biggest importer of wheat. Egypt spends more than \$4 billion annually to feed its population of more than 100 million. Turkey is also a big spender on Russian wheat. Russia's top 10 export partners of wheat in 2021 – Egypt (23%), Turkey

(21%), Bangladesh (5%), Azerbaijan (4%), Sudan (4%), Pakistan (4%), Nigeria (3%), Yemen (2%), Tanzania (2%), and United Arab Emirates (2%). (Table 16)

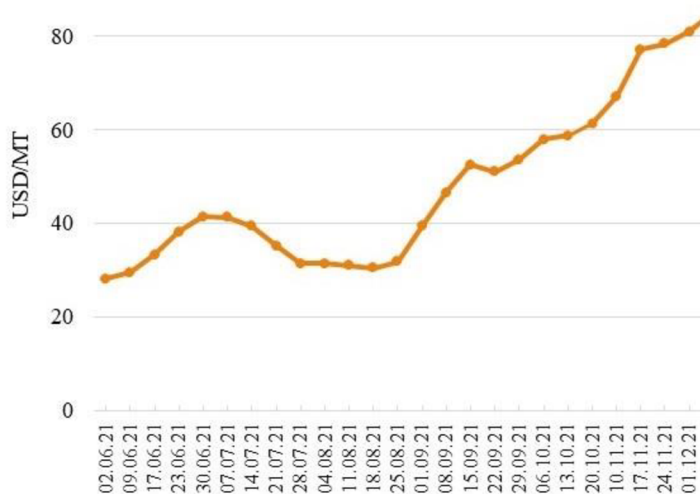
Table 16 Top Russian export partners of wheat 2021

Country	Value US\$ Million
Egypt	1,796
Turkey	1,686
Bangladesh	408
Azerbaijan	284
Sudan	282
Pakistan	277
Nigeria	207
Yemen	174
Tanzania	154
United Arab Emirates	146

Source: Rosstat

Since June 2, 2021, a grain damper mechanism has been introduced in Russia, which provides for floating duties on wheat exports and the return of funds received from them to subsidize agricultural producers. The duty is 70% of the difference between the indicative price (arithmetic average of daily price indicators) and the base price. The number of duties is calculated weekly based on price indicators based on the prices of export contracts that are registered on the Moscow Exchange. The cut-off price for wheat is set at \$200 per ton. (Figure 14)

Figure 14 Export duties on Russian wheat and their changes by week for 2021, USD/MT



Source: Federal Customs Service (customs.gov.ru)

However, the “grain damper” mechanism, adopted by the government and aimed mainly at curbing the appetites of grain traders, includes the return of funds received through the export duty to farmers, these funds will compensate for part of the costs of producing and selling grain. Also, this mechanism is aimed at preventing the growth of prices for grain and final products in the domestic market.

### Import

The main component in the structure of wheat imports to Russia (95% of the total wheat imports) is milling wheat with a high gluten content, strong and valuable wheat, mainly represented by the third class. The need to import high-quality wheat is due to its insufficient domestic production, which is primarily due to the climatic conditions of Russia. Class 3 wheat makes up about 10-15% of the gross harvest. At the same time, wheat with a high gluten content (more than 23%) is an indispensable raw material for the flour-grinding and baking industries, primarily due to technological necessity, since only with a high gluten content in flour is it possible to produce high-quality bakery products. Grade 3 wheat is most often used in combination with weaker wheat. A separate item of wheat import should be durum wheat, which is practically not grown in the climatic conditions of Russia but is the main raw material in the production of pasta. Wheat of lower classes is practically not

imported into Russia, since the demand for it is met by domestic production. Sowing material is also imported to Russia.

According to the analysis of FCS data, in December 2021, Russia imported 4.8 thousand tons of wheat. According to the results of 12 months, wheat imports to the Russian Federation amounted to 123.2 thousand tons (in 2020 - 186.4 thousand tons, in 2019 - 183.3 thousand tons). For the period January - December 2021, the main countries for the export of wheat to the Russian Federation were Kazakhstan (97.27%) and Belarus (1.17%). (Table 17)

Table 17 Wheat imports to the Russian Federation for January - December 2021 by country, metric tones

Import to Russia, breakdown by country, MT	2019	2020	2021												2021 Total
			1	2	3	4	5	6	7	8	9	10	11	12	
KAZAKHSTAN	181464	180446	15899	14135	13212	11905	14037	13623	13870	3184	5906	6215	3131	4752	<b>119871</b>
BELARUS	153	4579	117	115	443	565				156	49				<b>1446</b>
POLAND	670	136	40							40	738				<b>818</b>
GERMANY	139	592	140	20	62	142			20						<b>384</b>
CZECH REPUBLIC	447	397			235	21									<b>256</b>
LITHUANIA	240	203		20		20	20	20		32	20		20	20	<b>172</b>
FINLAND					30	49	17								<b>97</b>
FRANCE	20	21			28	65									<b>94</b>
AUSTRIA	93				14					20	42				<b>76</b>
HUNGARY											20				<b>20</b>
ITALY	41	21													
Total	183266	186393	16196	14290	14026	12768	14075	13643	13890	3432	6775	6215	3151	4772	<b>123234</b>

Source: Federal Customs Service (customs.gov.ru)

Wheat is imported mainly from Kazakhstan because there are a several of benefits such as ease logistics due to geographic location and low cost due to exchange rates. In 2021, wheat imports to Russia amounted to 123.2 thousand tons against 189.9 thousand tons in 2020. This is the lowest figure in the past 10 years. The entire volume falls on products coming from Kazakhstan.

#### 4.7.1 Balance

Based on all the data obtained earlier in the analysis, we can make a balance of wheat. We will calculate the balance of wheat in this way: we will add production and imports to stocks, so we calculate the total availability. To calculate total consumption, we add up food, feed, industrial, seeds, and others. Thus, in order to calculate the amount of the ending stocks at



the end of the period, we subtract the total consumption and export from the total availability. (Table 18)

Table 18 Russian wheat market balance 2013-2021, million tons

Jul/Jun	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/2020	2020/21
Opening Stocks	7,3	6,1	6,6	7,1	14,6	15,6	10	8,4
Production	52,1	59,1	61	72,5	85,1	71,7	73,6	85,4
Imports	1,1	0,3	0,7	0,4	0,3	0,4	0,3	0,2
<b>Total Availability</b>	<b>60,5</b>	<b>65,5</b>	<b>68,3</b>	<b>80</b>	<b>100</b>	<b>87,7</b>	<b>83,9</b>	<b>94</b>
Food	12,9	12,9	13	13,1	13,6	13,9	13,6	14
Feed	12,4	14	13	14,1	18,5	18	17,4	19
Industrial	1,5	1,5	1,8	1,9	1,9	1,9	1,7	1,7
Seed	7	7	7,7	8,1	7,8	7,7	8	8,1
Other	2	1,1	0,2	0,5	1,4	0,7	0,6	0,6
<b>Total Consumption</b>	<b>35,8</b>	<b>36,6</b>	<b>35,7</b>	<b>37,7</b>	<b>43,1</b>	<b>42</b>	<b>41,3</b>	<b>43,4</b>
Exports	18,6	22,4	25,5	27,8	41,3	35,7	34,2	38,4
Ending Stocks	6,1	6,6	7,1	14,6	15,6	10	8,4	12,2

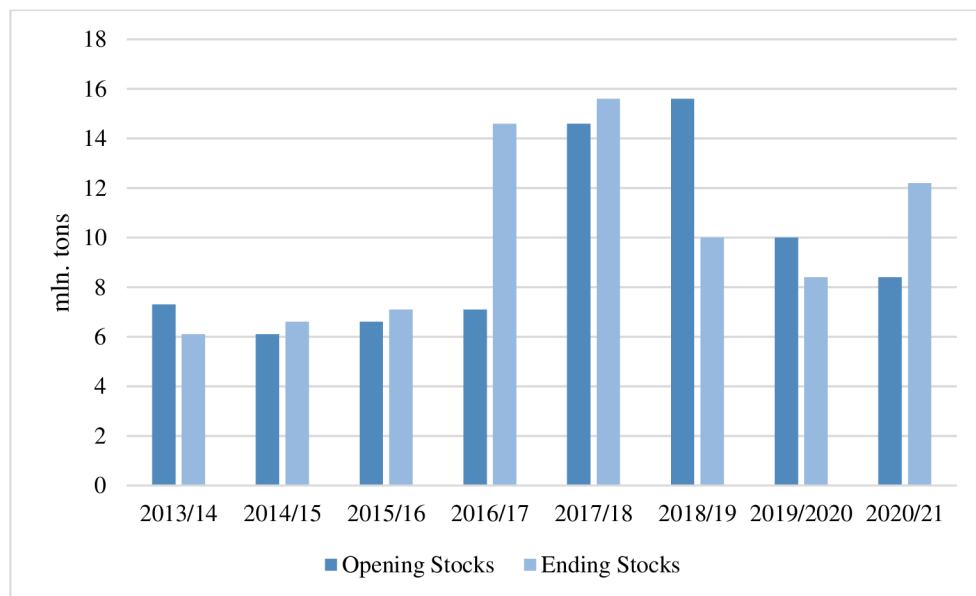
Source: Made by author from Rosstat and Fedstat data

As we can see from the calculations for the last 8 years, the balance of wheat for all periods was positive. The maximum value of stocks fell on the period of 17/18, this is interconnected with the fact, as we said earlier, in this year a record amount of grain was harvested compared to the previous decade. In the next two years, the harvest fell, which was reflected in the rest of the indicators, which correlated and decreased. Thus, the main two indicators affecting the ending stocks are the sum of exports and the harvest of wheat. The remaining indicators also have an impact in general, but not as much as the two that we have mentioned before.

Despite this trend, in 19/20, with an increase compared to the previous period of wheat harvest, the amount of exports and final stocks should also have increased, but on the contrary, exports decreased by 4,2%, which is interconnected with the fact that at the beginning of the period of stocks in 18/19 was more and this was reflected in the fact that despite the increase in grain harvest, exports and ending stocks decreased. In 2021, the maximum amount of harvested wheat was recorded, which amounted to 85.4 million tons, which is 16% more than in the previous year. Also in 2021, we observe the minimum number of imports for 8 years, which is 200,000 thousand tons per year, which is 81.8 percent more than in 2013. We can also note the gradual increase in the cost of wheat for food and feed, in 2021 these figures reach their maximum and amount to 14 and 19 million tons, respectively. Based on the data obtained, it can be concluded that the wheat market is

developing, which is indicated by a generally slightly slow growth in indicators of final and initial stocks. Of course, this indicates a positive trend, and that this growth trend will continue in the future. (Figure 15)

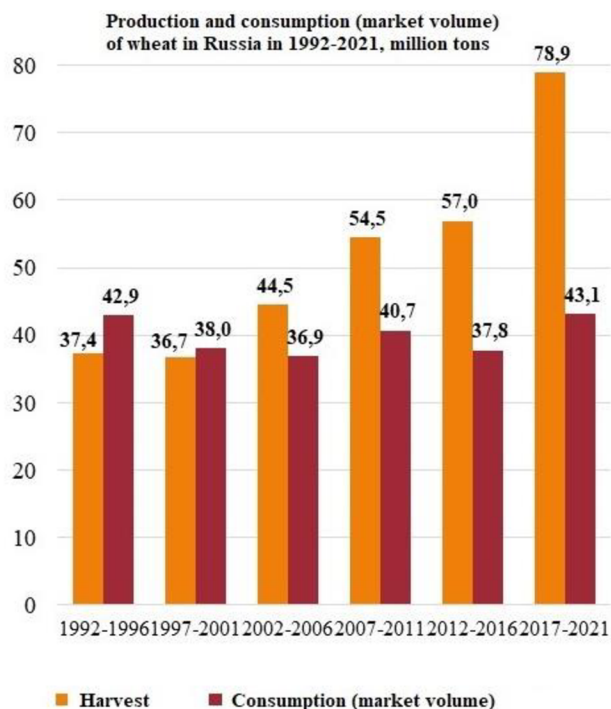
Figure 15 Dynamics of opening and ending stocks 2013-2021, million tons



Source: Made by author from Rosstat and Fedstat data

The market volume here is calculated as the sum of the volume of production and imports minus the volume of exports. The volume of the market is a very important indicator that allows you to formulate a general vision and follow the developing trends in this market. As we said earlier, the correlation between exports and grain harvest is a very important aspect in this market. According to the calculations, we can conclude that the Russian wheat market is still in the growth stage and is relatively stable with minor errors. However, we need to notice that even a jump in production over the past few years does not stimulate the market size to same growth rate as production. (Figure 16)

Figure 16 Balance of the Russian wheat market in 1990-2021

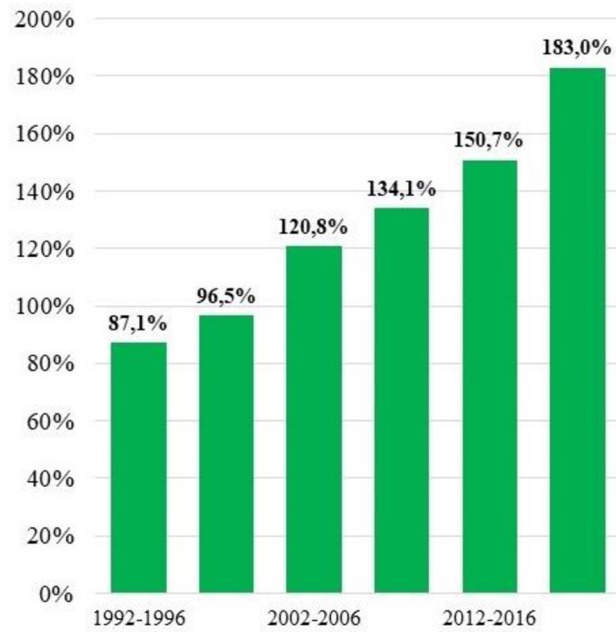


Source: Made by author from Rosstat and Fedstat data

Self-sufficiency - the ratio of production volume to market volume in percentage terms. The average annual volume of the wheat market over the past 5 years (2017-2021) reached 43,122.0 thousand tons, and self-sufficiency amounted to 183.0%. For comparison, in 2012-2016. the figures were 37,781.7 thousand tons and 150.7%, respectively. (Figure 17)

The Russian agricultural sector boosted after the imposition of the import embargo on certain agricultural products from Europe as part of the 2014 sanctions. Despite the slightly negative industry indicators in 2019, the number of subsidies in the agricultural sector was estimated to peak in the years to follow.

Figure 17 Self – sufficiency of Russia in wheat, %



Source: Made by author from Rosstat and Fedstat data

As a result, we see that Russia is fully provided with wheat and covers its consumption. That ensures free trade turnover of exports and imports. Sustainability indicators will only get stronger in the future. However, the Russian wheat market is very dependent on the world market, wheat prices on the world market, the exchange rate for the national currency and the dollar.

## **5. Results and Discussion**

Russia is a huge country with great potential and a favorable environment for the development and growth of the grain market and wheat market. The development of the domestic grain market throughout the historical stage was very contradictory. Thus, having relatively huge land and cheap labor resources for the cultivation of almost all grain crops, Russia almost constantly experienced a shortage of certain types of grain due to their insufficient production and irrational use.

At present, the situation in the Russian grain market is increasing the complexity of coordinating the interests of its participants in the national and world arenas. So, demand and higher profitability of trading operations for the state and large grain sellers limits its commercial mass in the domestic market or “forces” to look for schemes for manipulating the quality characteristics of grain in order to reduce its classiness in the production of flour used to bake bread for the general population. In addition, the high dependence of grain supply volumes on weather conditions, as well as sales prices on fluctuations in market conditions, poorly predictable and highly dynamic, the completeness of the infrastructural content of the country's territories determine the specifics of the organization of the grain market and its development.

Even before the Soviet Union, there was a large amount of sown area in Russia, they were counted according to statistics, but they were also not privatized and were the property of people who were not engaged in trading activities. In time process, the change of government and political difficulties have led to a redistribution of acreage for commercial activities. And in the 1990s, there was a crisis in sown areas, from these years until 2000, a decrease in crops began. In the long term, the situation began to stabilize, but the data that were maximum in the pre-crisis time still cannot be achieved. The problem of sown areas is now being actively dealt with by the government and the Ministry of Agriculture, trying to solve this problem, which seems absurd, that there is not enough land in Russia.

As for gross grain harvests throughout the entire observed period, they are unstable, of course, the harvest depends on many factors that a person cannot influence in principle, such as drought or frost. In 2017, a record harvest of all time was obtained and at the moment all efforts are focused on achieving such a result on a permanent basis or harvesting at a certain minimum. Krasnodar, Stavropol, Altai and Rostov were and remain the main regions for

growing wheat in Russia. These regions are located in such geographic positions that are most suitable for maximum wheat production. The wheat yield in Russia has only been growing over the years, of course, this is interconnected with technical and chemical progress in the field of fertilizers. Therefore, this is a natural phenomenon. However, even despite all the care for growing wheat, sometimes even careful behavior with all technical benefits to crops cannot help with the weather conditions and therefore minor deviations appear.

Russia during the period before the Soviet Union did not show good results in the export of wheat and grain in general. The main development of this market began after the Second World War, but also during the period of the Soviet Union, no records were recorded. As of the beginning of 2010, Russia was in 3rd place in the world in grain exports (after the US and the EU) and in 4th place in the world in wheat exports (after the US, EU and Canada). Over 10 years, Russia has become a solid leader among wheat exporters, ahead of the EU, the USA, Canada and Ukraine. In 2016 and then in 2018, Russia for the first time became the number 1 wheat exporter in the world. After 2018, Russia until 2021 ranks first in the ranking of wheat exporters. It is difficult to imagine how events will develop in the future due to the unstable situation in the country, due to which this market will most likely suffer due to the sanctions imposed on Russia.

Imports in the country remain stable with little change, with Kazakhstan remaining the main supplier. This situation most likely wouldn't to change. Russia imports mainly grain for planting and high-grade wheat, which is not grown in Russia.

After calculating wheat balance and self-sufficiency indicator, we can conclude that the Russian wheat market is still in the growth stage and is relatively stable with minor errors. However, we need to notice that even a jump in production over the past few years does not stimulate the market size to same growth rate as production. Russia is fully provided with wheat and covers its consumption. That ensures free trade turnover of exports and imports. The Russian wheat market is very sensitive to global changes, such as wheat prices on the world market, the exchange rate for the national currency and the dollar. However, it is impossible to prevent this dependence between the world market and the local state market, so Russia needs to find a solution to minimize the impact of external factors on the local wheat market.

## **6. Conclusion**

The research subject in this bachelor thesis was specific features and trends in the development of the wheat market on the example of Russia. The main objective of the thesis was to evaluate the development of the wheat market in Russia in the period 1990-2021 and to determine the factors that cause changes in the production and price of grain on this market. The analysis was performed based on a set of selected indicators that are used to monitor the market situation.

A comparison of countries by wheat production and export volumes shows that Russia is the leader among wheat exporters (1st place) and among the leaders in terms of production (but not the first in the world). Currently rising wheat prices on the world market can motivate countries to support the export of this commodity, as they will be able to earn more from it. However, the political crisis associated with the war in Ukraine, sanctions, the consequences of the coronavirus crisis and the interruption of international supply chains are factors that have an adverse effect on the agricultural policy of countries. As wheat is one of the basic food products, countries focus on promoting self-sufficiency in this commodity.

The results of the analysis of the self-sufficiency indicator show that Russia is completely self-sufficient in wheat. It has also been found that the productivity of the land in Russia is greatly increasing, allowing more grain to be produced. The wheat consumption indicator also has an increasing trend in Russia. The country must therefore be careful to ensure that its production remains for the needs of its inhabitants and limit exports through government intervention (e.g. quotas). It can therefore be concluded that Russia's position as a leader among wheat exporters on the world market will soon be lost. The main importers of Russian wheat are, for example, Turkey, Egypt, Iran, Saudi Arabia, China, Bangladesh, Kazakhstan. These countries should expect a reduction in supplies of the commodity from Russia.

Future analysis of the development of Russian wheat production and exports may be complicated by a lack of official statistics.

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### List of abbreviations

Rosstat	Russian Statistical Office
Fedstat	Unified Interdepartmental Information and Statistical System
FAO	Food and Agriculture Organization of the United Nations
BC	Before Christ
VIR	All-Russian Institute of Plant Industry named N. I. Vavilov
USD	United States dollar
Rub	Ruble
US	United States
EU	European Union
mm	millimeter
kg	kilogram

ha	hectare
pcs	pieces
sq m	square meter
FAO	Food and Agriculture Organization
IUCN	International Grain Council
USDA	United States Department of Agriculture
US	United States
CAGR	Compound annual growth rate
IGC	International Grains Council
RSFSR	Russian Soviet Federative Socialist Republic
USA	United States of America
WTO	World Trade Organization
USSR	Russian Soviet Federative Socialist Republic
EU	European Union
MT	metric tons

## Appendix

Appendix A - Sowing Area Of Cereals And Legums (Farms Of All Categories; Thousand Ha)

	2019	2020	2021	2021 in % to 2020
<b>The Russian Federation</b>	<b>46660,4</b>	<b>47899,8</b>	<b>46964,0</b>	<b>98,0</b>
<b>Central Federal District</b>	<b>8210,5</b>	<b>8682,9</b>	<b>8243,6</b>	<b>94,9</b>
Belgorod region	714,2	737,9	681,3	92,3
Bryansk region	387,0	406,8	407,4	100,1
Vladimir region	80,3	82,9	90,9	109,6
Voronezh region	1508,2	1584,4	1401,5	88,5
Ivanovo region	60,6	62,2	63,9	102,7
Kaluga region	84,0	99,3	89,6	90,2
Kostroma region	-	-	29,0	-
Kursk region	967,6	1041,1	1002,6	96,3
Lipetsk region	796,6	839,5	821,2	97,8
Moscow region	147,9	165,1	163,8	99,2
Oryol region	894,6	949,0	896,6	94,5
Ryazan region	630,5	681,3	702,7	103,1
Smolensk region	124,7	140,3	143,3	102,1
Tambov region	1079,2	1113,7	1023,6	91,9
Tver region	68,8	70,0	67,2	96,0
Tula region	588,8	637,6	620,4	97,3
Yaroslavl region	45,9	43,4	38,7	89,1
Moscow city	-	-	-	-
<b>Northwestern Federal District</b>	<b>329,0</b>	<b>320,3</b>	<b>346,4</b>	<b>108,1</b>
Komi Republic	-	-	-	46,1
Arhangelsk region	-	-	-	155,2
Arkhangel'sk region without autonomous okrug	-	-	-	155,2
Vologodskaya Oblast	103,3	86,4	91,1	105,4
Kaliningrad region	131,4	137,3	149,2	108,7
Leningrad region	39,4	41,4	42,6	102,9
Novgorod region	15,2	12,1	13,4	110,9
Pskov region	38,8	42,8	49,6	116,0
<b>Southern Federal District</b>	<b>9216,3</b>	<b>9263,4</b>	<b>9020,1</b>	<b>97,4</b>
Republic of Adygea	145,9	143,6	141,5	98,6
Republic of Kalmykia	285,6	276,8	267,6	96,7
Republic of Crimea	559,8	571,9	576,4	100,8
Krasnodar region	2464,3	2532,4	2587,7	102,2
Astrakhan region	15,1	15,2	17,0	111,9
Volgograd region	2162,3	2083,7	1831,1	87,9
Rostov region	3583,0	3639,5	3598,1	98,9
Sevastopol city	0,5	0,4	0,6	165,3
<b>North Caucasian Federal District</b>	<b>3353,0</b>	<b>3187,2</b>	<b>3366,5</b>	<b>105,6</b>
The Republic of Dagestan	149,7	157,5	165,2	104,9
The Republic of Ingushetia	49,1	53,0	48,4	91,4
Kabardino-Balkarian Republic	212,1	218,0	222,8	102,2
Karachay-Cherkess Republic	100,4	104,2	90,6	86,9

Republic of North Ossetia-Alania	138,9	136,8	143,0	104,5
Chechen Republic	179,2	196,6	211,8	107,7
Stavropol region	2523,7	2321,0	2484,8	107,1
<b>Volga Federal District</b>	<b>12871,5</b>	<b>13390,7</b>	<b>13172,4</b>	<b>98,4</b>
Republic of Bashkortostan	1670,5	1782,5	1716,7	96,3
Mari El Republic	122,1	134,8	142,8	105,9
The Republic of Mordovia	444,2	478,1	490,3	102,6
Republic of Tatarstan	1461,7	1552,5	1592,5	102,6
Udmurt republic	328,3	320,5	333,8	104,2
Chuvash Republic	268,7	293,3	301,3	102,7
Perm region	231,0	231,1	238,9	103,4
Kirov region	291,8	306,9	315,3	102,7
Nizhny Novgorod Region	551,0	578,6	594,4	102,7
Orenburg region	2629,1	2754,4	2592,5	94,1
Penza region	800,4	850,5	853,6	100,4
Samara region	1099,0	1144,8	1150,7	100,5
Saratov region	2332,1	2312,5	2193,8	94,9
Ulyanovsk region	641,8	650,3	655,7	100,8
<b>Ural federal district</b>	<b>3451,5</b>	<b>3531,6</b>	<b>3378,8</b>	<b>95,7</b>
Kurgan region	1061,1	1091,8	1042,8	95,5
Sverdlovsk region	317,5	322,7	314,8	97,5
Tyumen region	662,8	683,8	692,7	101,3
Tyumen region without autonomous regions	662,8	683,8	692,7	101,3
Chelyabinsk region	1410,1	1433,3	1328,6	92,7
<b>Siberian Federal District</b>	<b>8685,3</b>	<b>8992,6</b>	<b>8919,2</b>	<b>99,2</b>
Altai Republic	6,6	7,5	6,7	89,1
Tyva Republic	15,6	14,4	17,8	123,5
The Republic of Khakassia	72,8	78,1	39,9	51,1
Altai region	3169,0	3289,3	3234,6	98,3
Krasnoyarsk region	914,5	933,0	930,3	99,7
Irkutsk region	432,1	417,8	410,4	98,2
Kemerovo region	551,7	576,0	609,7	105,9
Novosibirsk region	1416,0	1482,8	1505,0	101,5
Omsk region	1945,1	2028,4	1997,7	98,5
Tomsk region	161,8	165,4	167,2	101,1
<b>Far Eastern Federal District</b>	<b>543,2</b>	<b>531,1</b>	<b>517,0</b>	<b>97,3</b>
The Republic of Buryatia	62,2	61,4	66,1	107,7
The Republic of Sakha (Yakutia)	10,4	9,1	10,7	117,3
Zabaykalsky Krai	119,7	112,0	115,3	102,9
Kamchatka Krai	0,1	0,0	0,0	100,0
Primorsky Krai	103,5	113,3	116,3	102,7
Khabarovsk region	9,2	10,0	8,9	89,4
Amurskiy region	232,1	220,1	194,8	88,5
Jewish Autonomous Region	6,0	5,2	4,9	93,2



Appendix B – Gross grain harvest by type of crops (In weight after refinement)

(Farms of all categories; Thousand tons)

	<i>Wheat</i>		
	<i>2020</i>	<i>2021</i>	<i>2021 in % to 2020</i>
<i>The Russian Federation</i>	<b>85894,4</b>	<b>76014,1</b>	<b>88,5</b>
<b>Central Federal District</b>	<b>23433,2</b>	<b>16553,6</b>	<b>70,6</b>
Belgorod region	2513,4	1860,6	74,0
Bryansk region	799,7	674,6	84,4
Vladimir region	144,4	113,7	78,7
Voronezh region	3883,4	1883,5	48,5
Ivanovo region	64,9	56,4	86,9
Kaluga region	179,9	151,2	84,0
Kostroma region	... <sup>1</sup>	... <sup>1</sup>	89,3
Kursk region	3250,4	2430,6	74,8
Lipetsk region	2793,5	1833,5	65,6
Moscow region	326,4	302,9	92,8
Oryol Region	2698,0	2280,7	84,5
Ryazan Oblast	1776,2	1436,3	80,9
Smolensk region	142,7	148,9	104,3
Tambov Region	2960,2	1644,3	55,5
Tver region	36,8	49,9	135,8
Tula region	1813,6	1650,6	91,0
Yaroslavl region	35,4	23,2	65,4
Moscow city	-	-	-
<b>Northwestern Federal District</b>	<b>671,4</b>	<b>698,8</b>	<b>104,1</b>
Komi Republic	-	-	134,6
Arhangelsk region	-	-	18,0
Arhangelsk region without autonomous okrug	-	-	18,0
Vologodskaya Oblast	16,1	15,4	95,5
Kaliningrad region	481,2	478,2	99,4
Leningrad region	48,0	49,0	101,9
Novgorod region	25,4	28,0	110,3
Pskov region	100,5	128,3	127,7
<b>Southern Federal District</b>	<b>24308,6</b>	<b>26359,9</b>	<b>108,4</b>
Republic of Adygea	480,7	436,3	90,8
Republic of Kalmykia	523,7	510,9	97,6
Republic of Crimea	542,8	855,9	157,7
Krasnodar region	7796,2	10069,7	129,2
Astrakhan region	-	11,7	-
Volgograd region	4408,8	2989,7	67,8
Rostov region	10545,7	11485,3	108,9
Sevastopol city	-	0,5	-
<b>North Caucasian Federal District</b>	<b>5138,2</b>	<b>7653,8</b>	<b>149,0</b>
The Republic of Dagestan	176,7	182,2	103,2
The Republic of Ingushetia	21,5	24,7	115,1
Kabardino-Balkarian Republic	155,8	199,0	127,7
Karachay-Cherkess Republic	48,7	84,3	173,2
Republic of North Ossetia-Alania	95,9	95,3	99,4
Chechen Republic	297,0	274,4	92,4

Stavropol region	4342,7	6793,8	156,4
<b>Volga Federal District</b>	<b>19443,8</b>	<b>10898,9</b>	<b>56,1</b>
Republic of Bashkortostan	1832,7	1011,4	55,2
Mari El Republic	124,5	94,2	75,7
The Republic of Mordovia	865,1	580,3	67,1
Republic of Tatarstan	2719,2	1214,1	44,7
Udmurt republic	195,2	151,2	77,4
Chuvash Republic	547,7	323,7	59,1
Perm region	149,0	109,7	73,6
Kirov region	176,6	143,9	81,5
Nizhny Novgorod Region	981,8	745,8	76,0
Orenburg region	2412,8	1011,2	41,9
Penza region	2373,3	1544,4	65,1
Samara Region	1913,7	1140,7	59,6
Saratov region	3779,8	2079,6	55,0
Ulyanovsk region	1372,5	748,6	54,5
<b>Ural federal district</b>	<b>2887,3</b>	<b>2395,3</b>	<b>83,0</b>
Kurgan region	1097,1	790,1	72,0
Sverdlovsk region	317,1	227,0	71,6
Tyumen region	809,6	661,0	81,6
Tyumen region without autonomous regions	809,6	661,0	81,6
Chelyabinsk region	663,4	717,2	108,1
<b>Siberian Federal District</b>	<b>9658,5</b>	<b>11086,3</b>	<b>114,8</b>
Altai Republic	0,8	0,8	93,1
Tyva Republic	10,7	9,3	86,8
The Republic of Khakassia	80,1	38,8	48,4
Altai region	2389,7	3380,7	141,5
Krasnoyarsk region	1712,0	1662,0	97,1
Irkutsk region	519,2	531,7	102,4
Kemerovo region	783,5	915,4	116,8
Novosibirsk region	1705,3	2174,6	127,5
Omsk region	2188,1	2116,0	96,7
Tomsk region	269,0	257,1	95,6
<b>Far Eastern Federal District</b>	<b>353,4</b>	<b>367,6</b>	<b>104,0</b>
The Republic of Buryatia	44,7	67,7	151,5
The Republic of Sakha (Yakutia)	1,1	1,1	94,7
Zabaykalsky Krai	62,4	73,9	118,3
Primorsky Krai	17,1	18,8	110,2
Khabarovsk region	-	3,3	-
Amurskaya Oblast	222,0	201,3	90,7
Jewish Autonomous Region	-	1,4	-

Appendix C – Average producer prices for sold wheat (End of period, rubles per ton)

	2021 y.			
	March	June	September	December
<b>Russian Federation</b>	<b>14095</b>	<b>13415</b>	<b>14173</b>	<b>15133</b>
<b>Central Federal District</b>	<b>13717</b>	<b>13447</b>	<b>13539</b>	<b>14843</b>
Belgorod region	13706	12646	13247	14462
Bryansk region	13811	13497	12793	15450
Vladimir region	13708	14710	15014	15578
Voronezh region	13492	13686	14055	14767
Ivanovo region	13482	17951	15287	12202
Kaluga region	-	13199	12826	14856
Kostroma region	-	-	-	-
Kursk region	13308	13653	13686	15337
Lipetsk region	13476	13098	14403	14302
Moscow region	8142	12730	10923	12161
Oryol Region	14610	13504	13470	14339
Ryazan region	13784	13526	12314	15688
Smolensk region	-	14109	-	15392
Tambov Region	13442	13542	14523	14322
Tver region	15499	13923	14999	-
Tula region	13822	13863	13312	14854
Yaroslavl region	-	-	-	-
<b>Northwestern Federal District</b>	<b>16260</b>	<b>16549</b>	<b>14100</b>	<b>15697</b>
Vologodskaya region	-	-	-	-
Kaliningrad region	16647	16819	15149	14901
Pskov region	15241	14980	13501	16474
<b>Southern Federal District</b>	<b>15733</b>	<b>14209</b>	<b>14991</b>	<b>15675</b>
Republic of Adygea	-	-	15431	16047
Republic of Kalmykia	14535	14459	13125	15396
Republic of Crimea	16497	14469	13683	15136
Krasnodar region	16926	15208	15402	16078
Volgograd region	13577	12787	14350	14176
Rostov region	15503	13824	14982	15390
<b>North Caucasian Federal District</b>	<b>16283</b>	<b>14241</b>	<b>14167</b>	<b>14841</b>
The Republic of Dagestan	-	-	10952	-
The Republic of Ingushetia	-	-	11764	-
Kabardino-Balkarian Republic	-	-	12454	-
Karachay-Cherkess Republic	-	-	-	-
Republic of North Ossetia-Alania	-	-	13808	14444
Stavropol region	16414	14251	14411	14874

	2021 y.			
	March	June	September	December
<b>Volga Federal District</b>	<b>12909</b>	<b>12568</b>	<b>13677</b>	<b>15238</b>
Republic of Bashkortostan	12744	12674	13000	15572
Mari El Republic	13213	12182	14092	16392
The Republic of Mordovia	11371	12394	13900	14055
Republic of Tatarstan	12018	11787	14962	16096
Udmurt republic	-	12908	-	-
Chuvash Republic	11484	12450	13928	14721
Perm region	14179	13770	11162	13883
Kirov region	12941	12659	12634	16323
Nizhny Novgorod Region	12595	12004	12677	15092
Orenburg region	14942	12561	15094	20424
Penza region	13055	12331	13477	14476
Samara Region	13309	13087	14490	15633
Saratov region	14019	12675	14522	15431
Ulyanovsk region	12833	12440	12813	15515
<b>Ural federal district</b>	<b>14342</b>	<b>14721</b>	<b>16651</b>	<b>18623</b>
Kurgan region	14842	14330	15796	17582
Sverdlovsk region	12356	13616	14244	16208
Tyumen region	13510	15194	15423	17128
Tyumen region without autonomous regions	13510	15194	15423	17128
Chelyabinsk region	19199	17645	21465	23252
<b>Siberian Federal District</b>	<b>13082</b>	<b>13162</b>	<b>12790</b>	<b>14135</b>
The Republic of Khakassia	11561	12167	-	14981
Altai region	15405	13874	12790	14996
Krasnoyarsk region	12622	12497	12010	14007
Irkutsk region	10345	10851	8776	11705
Kemerovo region	12356	12484	13483	13405
Novosibirsk region	12926	13287	12823	13188
Omsk region	13759	15947	13739	15170
Tomsk region	12634	12930	13464	14495
<b>Far Eastern Federal District</b>	<b>10640</b>	<b>12745</b>	<b>11437</b>	<b>13081</b>
The Republic of Buryatia	-	-	-	9475
The Republic of Sakha (Yakutia)	-	-	-	-
Zabaykalsky region	10899	13173	11316	11249
Primorsky region	-	-	13009	15610
Amur region	10630	10550	11311	12125