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Increasing the yield of wheat as the basic export crop of the agro-industrial complex of the Republic of Kazakhstan

Abstract

Object: The purpose of the work is to study the key problems of increasing the yield of wheat as a basic export crop, analyze the production of wheat in the nearest countries, consider the main world exporters and importers of wheat, and identify ways to increase the yield of wheat. The question of the development of this area of the agro-industrial complex is still open and requires the introduction of a number of innovative processes.

Methods: The methodological basis of the study was general scientific analysis and synthesis, system analysis, methods of economic and statistical analysis and comparative analysis were used.

Findings: The results of the study were the proposals of the authors to increase the level of productivity, such as: the creation of research laboratories; accessibility to obtain and the need to use mineral fertilizers, the need to train agricultural producers in the selection of mineral fertilizers, which not only increase grain yields and improve its quality; selection work and much more.

Conclusions: The study by the authors of the problems of increasing the level of wheat yields showed a direct dependence of production indicators and the volume of exports of wheat of the republic on its yield.

Keywords: productivity, agro-industrial complex, grain crops, fertilizers, rural cooperation.

Introduction

The most important indicator of economic independence, food safety, independence and well-being of any country is the production level of grain crops. Cereals are associated with bread, and bread is the basis of nutrition of any nation, as well as the main product of fodder for intensive animal husbandry. On the scale of the country, the production of grain crops becomes the most important object of foreign economic activity, and occupies a dominant position on the world market.

Hard varieties of spring wheat Kazakhstan have unique baking qualities, and the country has unique natural conditions for their production. Unfortunately, these advantages are not fully utilized. The level of production of grain for its further export does not meet the necessary needs, and this negatively affects the general state of the economy of our state. In this regard, the primary task of all farmers, agricultural enterprises of various forms of ownership are to increase productivity, and as a result, increase gross grain harvests.

Of course, the export potential of the grain industry is very high and currently has the most importance for Kazakhstan, as it is capable of meeting the domestic needs of the country's population. Kazakhstan is one of the world leaders in terms of gross grain collection, and among the CIS countries it takes the third place after Russia and Ukraine. Export wheat is the most competitive cereal crop. It is wheat, which is the most important cereal in export, that determines the trend and tendencies of changes in this group of products. However, Kazakhstan is making maximum use of its potential to increase its competitiveness on the global grain market. And the main reason for that is the low level of modernization and use of innovative technologies in the industry.

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Hypothesis. The use of mineral fertilizers allows you to dramatically increase the yield of any culture, but the decision to use them should be economically justified. Growth in wheat exports may be due to continued growth in the use of fertilizers, however, improperly selected fertilizer may have the opposite effect, reduce yield and make the soil unsuitable for several years.

Literature Review

The problems of the development of agricultural production were reflected in the works of many well-known domestic and foreign scientists. Kazakh and foreign scientists and economists were engaged in questions about the problems of the agro-industrial complex.

So, scientists Saginova S. A. and Sultanova G. T. they believe that "... The presence of huge ecologically clean territories creates favorable conditions for the development of organic agriculture. In our country, more than 70% of land is suitable for growing organic products, including grain products. And for the more effective development of this direction, it is necessary to attract measures to conduct inspections off arms, to train personnel, to create ware houses for obtaining certificates for producers of organic production, as it is associated with large costs..." (Saginova & Sultanova, 2017).

G.S. Akybaeva, M.N. Mukalieva, A.Jh. Koitanova said that "... the agro-industrial complex is considered one of the sectors of the economy of Kazakhstan, which makes a big contribution to the country's sustainable economic growth. There are many agricultural products in Kazakhstan that can be exported. Despite these advantages, the agro-industrial complex of Kazakhstan is characterized by low production productivity, characterized by low quality, underdeveloped infrastructure and insufficient financing..." (Akybaeva et al., 2023).

Krichker, D.R., Ruschitskaya, O.A. in their works, they talk about the historically established grouping of countries exporting agricultural products, including grain, where the three leaders are as follows: Russia, the USA and Canada (Krichker & Ruschitskaya, 2021).

However, taking into account the high level of development of the above-mentioned issues, the problem of increasing the yield of wheat as the basic export grain crop of our republic remains relevant, because Adequate assessment of this process is necessary at the current stage for the development of proposals for the most complete implementation of sowing and export opportunities.

Methods

The research is based on the use of general scientific methods of analysis and synthesis, system analysis, applied methods of economic and statistical analysis and comparative analysis. The application of these methods allows to objectively perceive the peculiarities and tendencies of the development of the agro-industrial complex of the Republic of Kazakhstan and the problems of increasing the yield of wheat.

The theoretical basis of research consists of the works of foreign, Russian and Kazakh scientists on the development of agricultural production, organization and solution of existing problems.

Results

In 2022, the Head of State K.K. in his annual message to the people of Kazakhstan Tokaev spoke several times about the need to develop the country's agro-industrial complex (Akorda, 2022), in particular:

- the need to improve the current state of the agro-industrial complex, as it strongly affects the food security of Kazakhstan;
- the need to increase the added value of Kazakh production through systematic growth of production volumes;
- the need to find fundamentally new methods of subsidizing APC, strengthening monitoring and control for development;
- the need to introduce innovations in the APC. At the moment, a single digital database has been created that accumulates all information about the current state of all sectors of the APC (Akorda, 2022).

As part of these instructions, it is assumed that from 2023, the APC should start functioning differently. For this purpose, 2.9 million hectares of agricultural land have already been returned to the state and another 5 million hectares will be returned. According to the data of the Bureau of National Statistics, about 10 million hectares are not in use or were previously allocated or designated.

Since the moratorium on inspections has been lifted, it is expected that the Government and administration will take appropriate measures by the end of 2023.

Based on the above aspects, the authors conducted a study based on the analysis of production and productivity of wheat as a basic export crop.

Thus, the rating of the top 16 wheat-producing countries in 2021 looks as follows (Fig. 1).

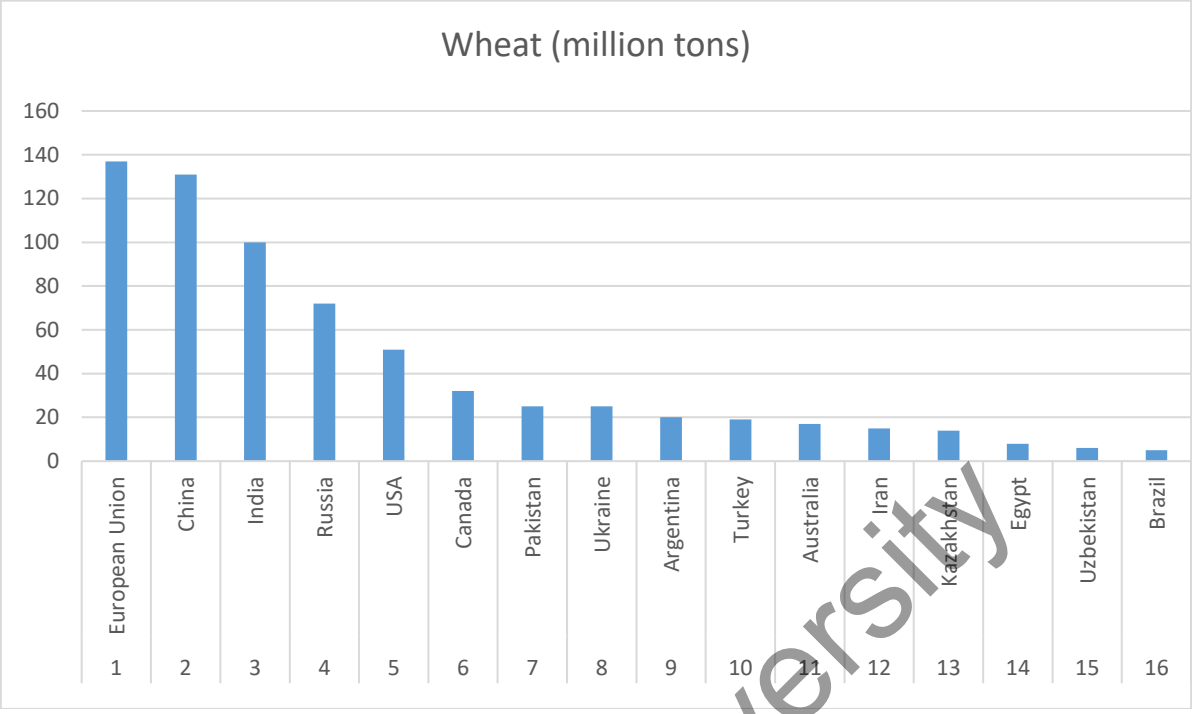

Figure 1. Ranking group of 16 wheat producing countries

Note – compiled by the authors according to (Pyagay, Bespayeva, Iskakova, 2022)

We consider production in the nearest countries — in Russia, Ukraine and compare it with Kazakhstan.

According to the Ministry of Agriculture of the Russian Federation, about 7 mln. t of wheat by the end of 2023. The absolute increase compared to 2021 was 70.8 million. tons, that is on 27 mln. tons more. The total collection of grain and leguminous crops amounted to 132.3 million. t (99.4 million t a year ago). Agricultural cultivation is 38.6 million ha (37.5 million ha in 2021). Thus, the average yield is 34.3 t/ha (26.5 t/ha in 2021).

According to the press service of the Ministry of Agricultural Policy of Ukraine, on the basis of analytical forecasts, the total wheat harvest as of November 19, 2021 is 7 mln. hectars is about 32.6 million. tons, which significantly exceeds the current forecast for 2022. The gross sum is 2.5 mln. hectars is 9.64 million. tons, the yield of wheat is 46.3 t/ha, and corn — 21 mln. tons. almost 3 million hectares of land (Digest, 2021). With an average yield of 13.0 t/ha, 20.1 million tons of grain were moistened. In 2021, with an average yield of 9.8 t/ha, 14.9 million were irrigated. tons or 25.9% less.

In Kazakhstan, in terms of crops, including socially important, the area of wheat harvesting is 12.9 million ha, of which 12.6 million ha or 98.1% were harvested with a yield of 12.4 t/ha and 15.5 million tons (Karashukeev, 2022).

Based on the obtained data, it should be noted that the yield of wheat in Russia is 34.3 t/ha, in Ukraine 46.3 t/ha, and in Kazakhstan 12.4 t/ha. In 2022, the yield in Kazakhstan will be more than 2.7 times lower than that in Russia, and it will be more than 3.7 times lower than that in Ukraine. Comparing the data for 2021, it is 3.7 times compared to Russia and 5 times compared to Ukraine.

The ratio of the productivity of 2022 to 2021 in Kazakhstan indicates that the productivity increased by 25.9% compared to 2021. However, in 2020, the average yield was 11.9 centners per hectare and 13 million were irrigated. tons of grain, which indicates the negative effects of the pandemic on agriculture in 2021.

Since the wheat harvest exceeds domestic consumption many times, part of the harvested wheat is exported. In the ranking of the leading exporting countries in 2021, it is clear that Russia takes the 1st place with an export volume of 30 mln. tons (Orlova & Nikolaev, 2022) to Ukraine in 5 places with an export volume of 14 mln. tons, Kazakhstan occupies the 9th place with an export volume of 5 mln. tons (Table 1):

Table 1. Country — leader in wheat export, 2022

No.	Name of the country	Wheat export volume (million tons)	Export share in the world market (in %)
1	Russia	30	16,67
2	USA	26	14,44
3	Canada	26	14,44
4	France	19	10,56
5	Ukraine	14	7,78
6	Australia	12	6,67
7	Germany	9,2	5,11
8	Argentina	9	5,00
9	Kazakhstan	5	2,78
10	Poland	4	2,22
Note – compiled by the authors according to (Gridneva et al., 2023)			

However, not all large countries have the export potential of wheat, rather, on the contrary, they are recognized as leaders among importers: China imported 10.5 mln. tons and Turkey 8.2 mln. tons (Table 2).

Table 2. Leading countries in import of wheat, 2022

No.	Name of country	Volume of imported wheat (million tons)
1	Egypt	13
2	China	10,5
3	Indonesia	10,5
4	Turkey	8,2
5	Philippines	6,8
Note – compiled by the authors according to (Andrei T. et al., 2022)		

The authors deliberately chose these states, as they, similarly to Kazakhstan, are recognized as countries of the post-Soviet period, in which agriculture is developing almost identically, and farmers are in relatively equal conditions and are among the 10 world exporters of wheat.

Thus, the export potential of Kazakh wheat with domestic consumption is 10 mln. Tons will increase by 6 times and Kazakhstan will most likely enter the top three wheat export leaders in the world.

It should be noted that the positive dynamics of wheat exports provoked a steady rise in wheat prices on the world market over the past 5 years (Fig. 2).

With a correctly constructed state strategy and a gradual increase in volumes, Kazakhstan can become a leader in the export of wheat.

To evaluate the competitiveness of goods, they often refer to the concept of B. Balassi, according to which the competitive advantage consists in a sufficiently large share occupied by the product in the international market, accordingly, the lack of competitive advantage consists in the low share of this product in export markets. For this, they use the tool developed by him — the ratio of comparative advantages (RCA), which has the following form

$$RCA_{ij} = \frac{E_{ij}}{E_{wi}} : \frac{E_{je}}{E_{we}}, \quad (1)$$

where

- export of goods i from country j;
- global export of goods i (except for the export of country j);
- export of all goods produced in country j;
- world export of all goods (except for the goods of country j).

It is assumed that if the value of the RCA coefficient exceeds unity, the country is competitive in the production of this product, if it is less than unity, the country has no competitive advantage. At first glance, the RCA coefficient can be used to identify sectors of the economy in which the country has a competitive advantage (Table 3).

Table 3. Competitive commodity positions for export of the Republic of Kazakhstan, 2018–2022

Name production, %	2018	2019	2020	2021	2022
Cereals, in t.ch.	2,6	3,2	3,0	2,9	3,1
Wheat and meslin	5,9	7,7	8,1	7,5	7,8
Note – compiled by the authors according to (Andrei T. et al., 2022)					

Many factors influence wheat productivity, and the ability to export wheat is directly proportional to its productivity. Let's highlight the main ones:

1) factors of a natural nature, such as soil fertility, climate conditions;

2) factors of an agro-technological character, such as methods of soil treatment, selection of sowing time, protection from weeds and insects;

3) a factor of a biological nature. These include seed genetics, seed preparation for sowing, growth stimulants;

4) factor of fertilizing character (Amalova et al., 2019).

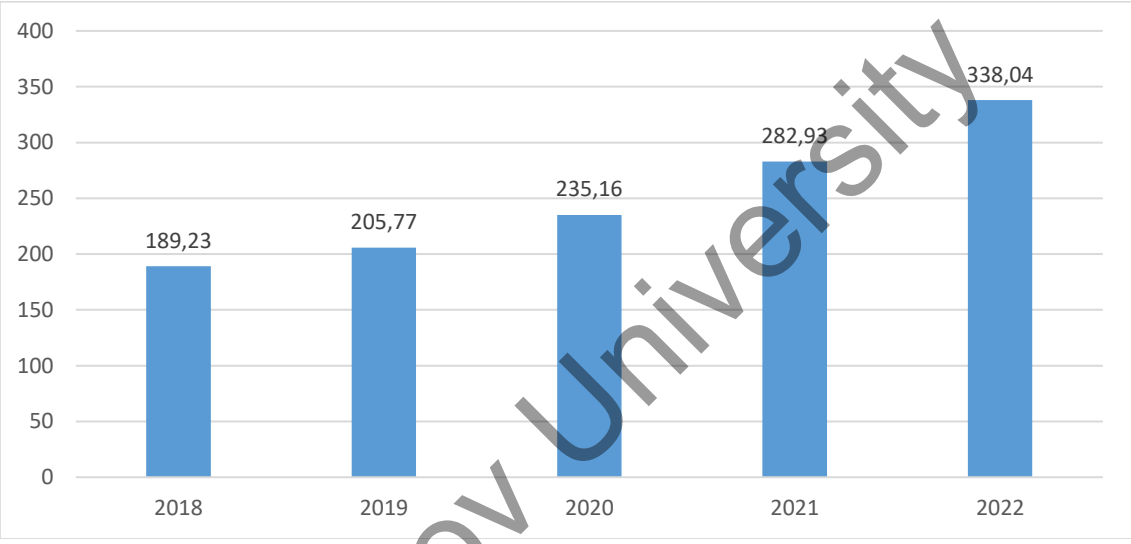

Figure 2. Dynamics of wheat prices, dollars USA

Note – compiled by the authors according to (Swathi & Sridharan, 2022)

Discussions

In order to increase the yield of wheat per hectare, it is necessary to take into account the presence and content of nutrients and trace elements in the soil for the fruitful ripening of the crop. For this, it is necessary to know and understand, taking into account the analysis of the soil, what elements, in what quantity and at what time are required for grain crops. Today, the soil analysis procedure is important, it significantly saves money on the cost of applying mineral and organic fertilizers and makes this application economically feasible and profitable (Orazaeva &, 2021).

The use of mineral fertilizers, as experience shows, becomes the main technological way to improve the quality and yield percentage of grains in general and wheat in particular. Adequate application of fertilizers can increase wheat yield by 2-3 times. In order to provoke growth in the efficiency of field work and productivity, it is necessary to adhere to a number of recommendations on the use of mineral fertilizers at each stage of growth and maturation of the culture. This algorithm is able to further reduce the cost of sowing 1 ha of wheat. The required number of mineral fertilizers and other trace elements are introduced taking into account the planned yield, agrotechnology and forecasted rainfall. The maximum effect is achieved with partial, repeated application of mineral fertilizers in autumn and spring, as well as during the period of crop cultivation. Humidity and soil composition are important (Genievskaya et al., 2019).

When choosing one or another type of wheat, the following factors are taken into account:

- breeding method;
- soil moisture;
- the location of the field;
- temperature background;

- landing period;
- the number of fertilizers and the frequency of their application (Mitikul & Regassa, 2019).

Thus, it is possible to conclude that in the 21st century, productivity depends on the provision of agro-industrial complex with innovative solutions, approaches and technologies. And for this, laboratories are needed for soil analysis, selection of crops for the Kazakh climate, production of fertilizers and much more.

A. B. Tleubayev, a Kazakh scholar. An analysis of the use of mineral fertilizers was carried out, according to the results of which it was established that Kazakhstan used 2.9 kg of mineral fertilizers per 1 ha of arable land (Karashukeev, 2022). Meanwhile, 22.3 kg/ha of mineral fertilizers were used in Russia, and 63.4 kg/ha in Ukraine (Fig. 3) (Tleubaev, 2021).

Tleubayev A.B. It is noted that Kazakhstan and Canada have the same climatic conditions for grain production. At the same time, Canada uses 105 kg/ha of mineral fertilizers, and Kazakhstan uses only 2.9 kg/ha of mineral fertilizers, the yield is 31 kg/ha in Canada, and 12 kg/ha in Kazakhstan. Using the methods of mathematical analysis, it is possible to calculate, with a sown area of 12.9 mln. ha and productivity of 31 t/ha, Kazakh producers could get about 40 mln. tons of wheat at the former world price of wheat in the amount of about 300 US dollars per ton, the total wheat harvest of Kazakhstan was estimated at 12 bln. US dollars.

Based on the reverse, with a yield of 31 t/ha and a harvest of 15 mln. tons, we need only 4.83 million. ha of seed plots, which is 2.58 times less than current indicators. And this would lead to a reduction in the production costs of agricultural producers, a reduction in the purchase of large volumes of fuel, minimization of the rental of additional equipment and workers.

With well-chosen mineral fertilizers, not only the yield of grain increases and the time of ripening is accelerated by 5-6 days, its quality improves. Therefore, the cleaning campaign begins earlier and in conditions of comfortable heat. Wheat acquires the properties of maximum drought resistance and water consumption costs are significantly reduced, the root system becomes stronger and, accordingly, the variety has qualities that are more resistant to external influences (Stukach, 2019).

"KazAzot" and "KazPhosfat" are recognized as the largest enterprises in Kazakhstan for the production of mineral fertilizers. As a result, 378 thousand were produced in Kazakhstan in 2021. Tons of nitrogen fertilizers, the production of phosphoric fertilizers amounted to 393.4 thousand tons. In the forecast, the planned increase in the total capacity of domestic enterprises producing fertilizers, which in 2022 will amount to 1 mln. 156.6 thousand tons (Top of the largest suppliers of fertilizers in Kazakhstan, 2022). At the sown area of 5 mln. 105 kg/ha of mineral fertilizers and 525 thousand will be required per ha. tons of fertilizer, and 12.9 mln. 1 million 354.5 thousand ha. tons of fertilizers and only talk about harvest wheat.

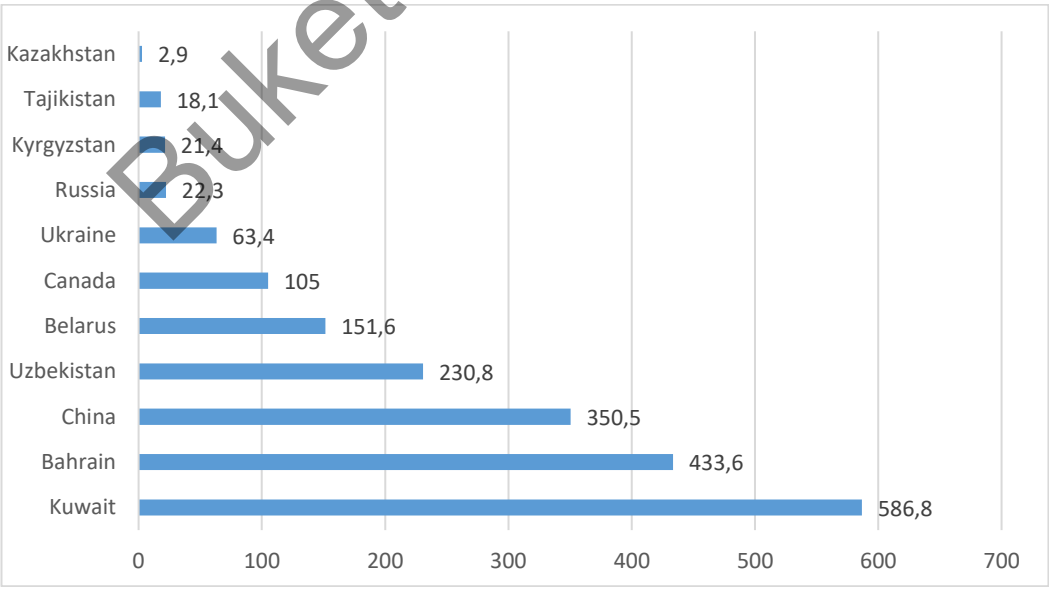

Figure 3. Use of mineral fertilizers on the total area of arable land, kg/ha

Note – compiled by the authors according to (Pyagay et al., 2022).

Conclusions

Thus, in the process of implementation of the instructions of the head of state and, within the framework of the development of the agro-industrial complex, many questions remain open, the solution of which requires a lot due to the introduction of innovative processes, such as:

- creation of research laboratories for soil analysis, selection of crops for the Kazakh climate, production of fertilizers;

- the availability of mineral fertilizers, since the main agrotechnical method that increases the quality and yield of wheat is the use of fertilizers, competent and correct application of mineral fertilizers can double the yield under certain conditions;

- training of agricultural producers on the selection of mineral fertilizers, which not only increase grain yield and improve its quality;

- carrying out selection works.

Since the volume of wheat export directly depends on its productivity, systematic implementation and implementation of the above-mentioned measures will increase the level of productivity in the near future.

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Қазақстан Республикасы агроөнеркәсіп кешенінің негізгі экспорттық дақылы ретіндегі бидай шығымын арттыру

Аңдатпа:

Мақсаты: Жұмыстың мақсаты негізгі экспорттық дақыл ретінде бидайдың өнімділігін арттырудың негізгі мәселелерін зерттеу, жақын орналасқан елдердегі бидай өндірісін талдау, бидайдың негізгі әлемдік экспорттаушыларымен импорттаушыларын қарастыру, жолдарын анықтау, сонымен қатар бидайдың өнімділігін арттыру. Агроөнеркәсіптік кешеннің осы саласын дамыту мәселесі әлі де ашық күйінде қалып отыр және бірқатар инновациялық процестерді енгізуді талап етеді.

Әдісі: Зерттеудің әдістемелік негізін жалпы ғылыми талдау мен синтез құрады, жүйелік талдау, экономикалық-статистикалық талдау және салыстырмалы талдау әдістері қолданылды.

Нәтижесі: Зерттеу нәтижелері авторлардың өнімділік деңгейін арттыру бойынша ұсыныстары болды, мысалы: ғылыми-зерттеу зертханаларын құру; минералды тыңайтқыштарды алудың қолжетімділігі және пайдалану қажеттілігі, ауылшаруашылығы тауарын өндірушілерді астық өнімділігін арттыру және оның сапасын жақсарту ғана емес, минералды тыңайтқыштарды таңдауға оқыту қажеттілігі; селекциялық жұмыстарды жүргізу және т.б.

Қорытынды: Авторлардың бидай өнімділігін арттыру мәселелерін зерттеуі республиканың бидай өндірісі мен экспорты көрсеткіштерінің оның өнімділігіне тікелей тәуелділігін көрсетті.

Кілт сөздер: өнімділік, агроөнеркәсіп кешені, дәнді дақылдар, тыңайтқыштар, ауыл кооперациясы.

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Повышение урожайности пшеницы как базовой экспортной культуры агропромышленного комплекса Республики Казахстан

Аннотация:

Цель: Целью работы является исследование ключевых проблем повышения урожайности пшеницы как базовой экспортной культуры, проведен анализ производства пшеницы в ближайших странах, рассмотрены основные мировые экспортеры и импортеры пшеницы, а также определены пути повышения урожайности пшеницы. Вопрос развития этого направления агропромышленного комплекса все еще остается открытым и нуждается во внедрении ряда инновационных процессов.

Методы: Методическую основу исследования составили общенаучные анализа и синтеза, системного анализа, применялись методы экономико-статистического анализа и сравнительного анализа.

Результаты: Результатами исследований стали предложения авторов по повышению уровня урожайности, такие как создание исследовательских лабораторий; доступность к получению и необходимость применения минеральных удобрений; необходимость обучения сельхозпроизводителей по подбору минеральных удобрений, которые не только повышают урожайность зерна и улучшают его качество; проведение селекционных работ и многие другие.

Выводы: Исследование авторами проблем повышения уровня урожайности пшеницы продемонстрировало прямую зависимость показателей производства и объема экспорта пшеницы республики от ее урожайности.

Ключевые слова: урожайность, агропромышленный комплекс, зерновые культуры, удобрения, сельская кооперация.

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