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Economic analysis of spring soft wheat seed production in North Kazakhstan region

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Abstract. In today's reality, the agriculture plays a very important role not only in achievement of sustainable economic development, but also in solving the global problem of hunger and ensuring the state independence from external food supplies. All above makes this industry an important factor for consideration in many countries. In this paper, the authors placed the emphasis on the economic analysis of individual crops in the industry, namely spring wheat in the North Kazakhstan region. Thus, the purpose of the work was to calculate the economic feasibility of growing this crop. The analysis was the main method during writing process. Besides, statistical research methods played an important role, as well as comparison, modelling, induction, and other methods. The article demonstrated that the cost of elite seed production is much higher than the cost of commercial grain crops per hectare. At the same time, the seed production helps to increase profitability per hectare; however, it can be observed the opposite trend in terms of efficiency per unit of capital invested, which was higher for producers of commercial grains than seeds. With that, the specifics of seed production impose higher requirements on agricultural producers in terms of energy efficiency, namely the provision of machine-tractor fleet and fleet of agricultural machinery, storage facilities, as well as equipment for cleaning grain. The paper draws conclusions about the decision for entrepreneurs to invest in the production of one or another type of product. The article brings new knowledge for understanding the peculiarities of economic development in Kazakhstan, especially in regional aspect and sector specifics

Keywords: Kazakhstan's economy; regional development; agriculture; entrepreneurship; investment



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INTRODUCTION

The relevance of this work is about the expert assessment formed on the profitability of several types of grain production in the North Kazakhstan region and making recommendations in the case of investment in this type of business. The agriculture plays an important role in the development of the state both economically and strategically (Zhang & Diao, 2020; Steinke *et al.*, 2019). There are several reasons for this. First, the agriculture in the vast majority of countries occupies a large part of the country's GDP (gross domestic product) (Schierhorn *et al.*, 2020; Meijerink & Roza, 2007); second, any state requires producing a certain amount of goods in this sector on its own in case of a crisis in the world economic system or other force major situations. In addition, the agriculture plays an important role for regional development because of its ability to provide jobs even in the poorest parts of the country, as well as to develop local infrastructure (Loizou *et al.*, 2019; Wang *et al.*, 2022).

In Kazakhstan, as a country that is essentially developing, the agriculture also plays a significant role (Petrick & Pomfret, 2016). However, given the high role of regional development in the country (Ursulenko, 2010), the authors decided to focus on only one region, namely North Kazakhstan. Since the main component of the products manufactured in the region is spring wheat seeds, the authors conducted an economic analysis of the feasibility of the manufacture of these products compared to another option for investing funds. According to the authors, such specialization will help to study certain features of the agricultural management in the region in more detail and to find ways to improve it.

A review of the literature has demonstrated that in recent years a number of papers have been published regarding the productivity and yield of wheat in the conditions of North Kazakhstan region. The number of papers regarding the economic analysis of the manufacturing process is limited not only in relation to North Kazakhstan region but also for the Republic of Kazakhstan as a whole. Nevertheless, it can be highlighted some of the works that came in handy during the study. First of all, the work of scientists who have studied agriculture in the Republic of Kazakhstan as a whole, such as F. Shulenbaeva *et al.* (2019), who examined the investment attractiveness of the industry and described possible scenarios for its future development. The works of importance featured the opinions of the scientists focused their attention on the development of the agriculture in the North Kazakhstan region. For example, the work of A.V. Shurr (2014) was helpful, which described in detail the state of the agriculture in the region and its individual areas. Another important observation was the article K. Abdullaev *et al.* (2020) who examined the possibility of changes in the agriculture in the North Kazakhstan region due to a more active use of some innovative technologies.

Therefore, the purpose of this article was to analyse the production of spring soft wheat seeds in the North Kazakhstan region and to assess the rationality of growing these products in the region. The object of the study was the costs and income for the production of this type of product, the process of its manufacture and the agricultural sector of Kazakhstan as a whole.

MATERIALS AND METHODS

As part of the work, the main objective was to explore the economic rationality of the production of the spring wheat seed in the North Kazakhstan region. However, examining the feasibility of any production process is quite difficult without being able to compare several options for investment. Therefore, in this work authors decided to compare the level of economic benefits from the production of commercial grain and elite spring wheat seeds, which helped to form quality conclusions about the feasibility of the manufacture of the studied products. In order to determine what type of production is the most profitable, authors chose two main indicators: profitability per unit area and the ratio of profit to cost. The first is calculation of the net profit (i.e., income minus all expenses) from the production of a certain type of wheat from one hectare of territory and the second is the ratio of net profit to the company's expenses.

The works of other scholars were important sources for compiling this paper. In addition, some components of the regulatory framework were used, in particular the Order of the Acting Minister of Agriculture of the Republic of Kazakhstan No. 4-2/266 "On approval of the Rules for certification of producers of original and elite seeds, seeds of the first, second and third reproductions, sellers of seeds" (2015). In addition, the work also uses statistical data sources, where worth mentioning is the Kazakh Scientific Research Institute for Economics of Agro-Industrial Complex and Rural Territories Development (2022), the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022), local executive bodies of North Kazakhstan region, as well as data on the seed producers of North Kazakhstan region.

The main methods used in writing the paper were theoretical methods. Among the first was the analysis, which justified the amount of comparable and analysed data on the economic production of wheat in the North Kazakhstan region. In addition, authors used the comparison, with the help of which it was possible to better study the economic feasibility of seed production. The modelling played an important role in examining the economic benefits of seed and commercial grain production. In addition, the authors actively used the method of induction. Moreover, the work used statistical and economic analysis methods, including functional-value method, which evaluated the production of one

of the types of wheat in Kazakhstan. The entire research process can be divided into several stages. At the first stage, a general overview of agriculture was conducted, where the main goal was to investigate the economic feasibility of agriculture in the Republic of Kazakhstan and, in particular, in its individual regions, including the North Kazakhstan region for 2010-2021. In the second part, the authors conducted a direct analysis of the economic production of spring wheat in the North Kazakhstan region in terms of comparison between the

manufacture of commercial grain and elite seeds and evaluation of the yield per unit area or invested funds.

RESULTS

In general, the agriculture is one of the most important sectors of Kazakhstan's economy: in the mid-10s of the XXI century, it was even the most profitable of other economic activities (Shurr, 2014). This is also confirmed by its significant share in the production of the country's GDP, as shown in Figure 1.

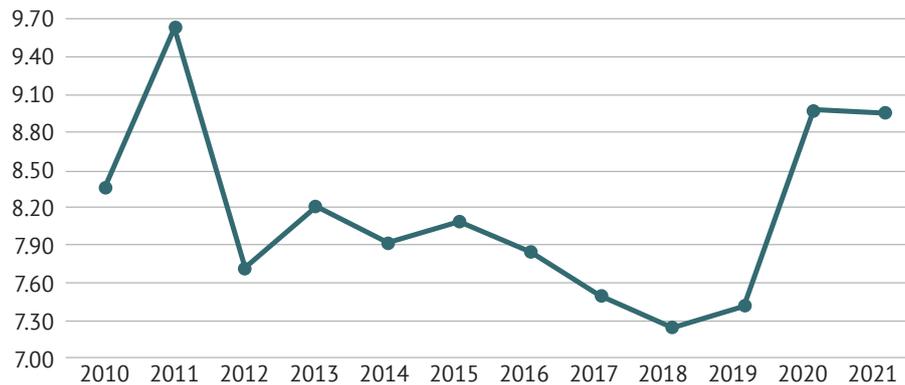


Figure 1. Share of GDP produced in the agriculture in the total GDP of Kazakhstan in 2010-2021, %

Source: compiled by the authors based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022)

As can be seen in Figure 1, the share of the agriculture in Kazakhstan's GDP has remained at about the same level by 7-9% year after year. This part of the agricultural sector in the country's GDP is quite large by comparison with other countries: for example, the most highly

developed countries the agricultural sector may have only 1-2% of GDP (Karatayev *et al.*, 2022). In order to examine the development of this industry in the country, authors constructed Figure 2, which describes the volume of production in the industry and the rate of its change.

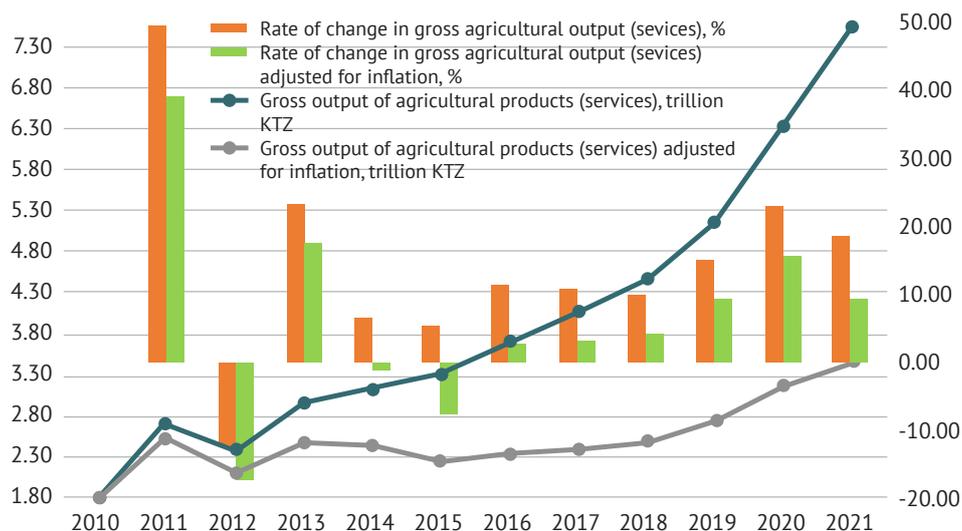


Figure 2. Volume and rate of change in gross output (services) of the agriculture in Kazakhstan in 2010-2021 with and without inflation

Source: compiled by the authors based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022); Inflation in Kazakhstan (2022)

As can be seen in Figure 2, even taking into account inflation, the level of the agricultural development in the Republic of Kazakhstan has improved significantly, as evidenced by the significant growth rates of output of the industry: so, considering inflation this level has increased by about 90% over the past 11 years. In addition,

fluctuations in the agricultural output are much lower than the country's total GDP. An assessment should also be made of the volume and the rate of change in gross output in the North Kazakhstan region, as this work evaluates the production of seeds notably from this region. This data is presented in Figure 3.

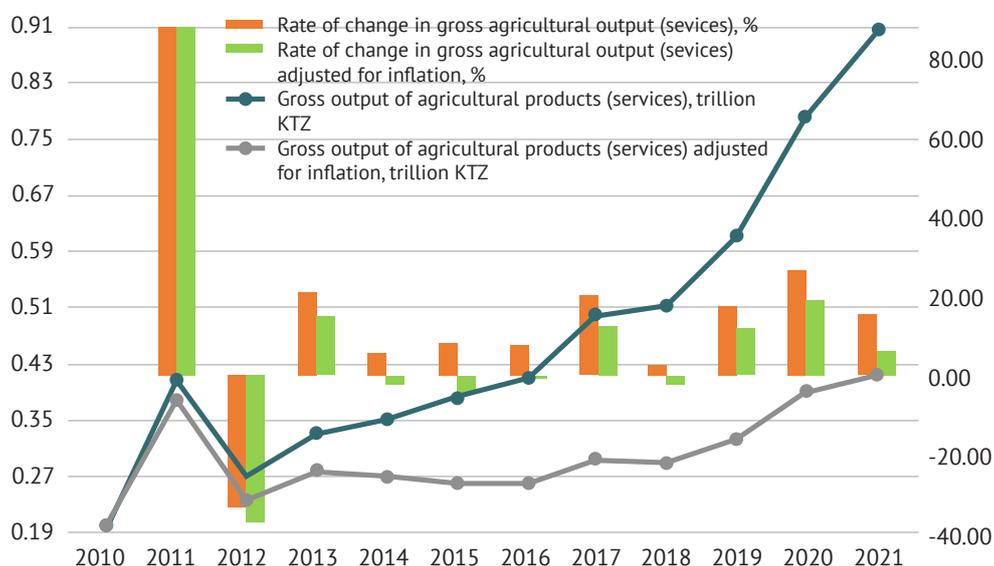


Figure 3. Volume and rate of change in gross output (services) of the agriculture in Kazakhstan in 2010-2021 with and without inflation

Source: compiled by the authors based on data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan (2022); *Inflation in Kazakhstan (2022)*

The territory of the North-Kazakhstan region also saw a significant increase in the agricultural output over the past 11 years. This was the reason to achieve a growth rate for this period of 109%, and also led to the fact that regional share in the total production by regions has reached a level of 12% (with 10% in 2010). Here it is worth noting that wheat is one of the main crops of the Republic of Kazakhstan (Petrick and Gotz, 2019; Feher and Fieldsend, 2019). The country produces about 12 million tons of wheat each year and exports more than 7 million tons; it is also one of the largest producers and exporters of soft wheat. The main regions of Kazakhstan where wheat is cultivated are the North Kazakhstan, Kostanay and Akmola regions. They account for 9.1 million hectares or 78% of the sown area and their share in the gross harvest of wheat is 76% at 10.1 million tons. North-Kazakhstan region shares with Turkestan region the second place among 14 regions by contribution to gross output of the agriculture in

the republic. At the same moment, the share of crop production accounts for 75% of all agricultural production in the region. The dominant crop is wheat, which occupies half of the sown area or more than 2 million hectares annually.

In determining the economic return of the manufacture of one or another product, a comparative economic analysis is inevitable (Williamson, 1991; Moor, 1971). This paper compares the production of elite seed and commercial grain of spring soft wheat. The seeds make 10-15% of total variable expenses in the cost structure of wheat production. At the same time the seed quality, and namely their responsiveness to means of intensification, is a key factor that can significantly increase yields (Table 1). The expenses on commercial grain production are based on the direct costs per 1 hectare of sowing in 2020, calculated by the Kazakh Scientific Research Institute for Economics of Agro-Industrial Complex and Rural Territories Development (2022).

Table 1. Structure of expenses for the production of elite seeds and commercial grain of soft wheat, KZT

No.	Name of items	Grains	Seeds
1	Remuneration of labour	3366.0	26168
2	Seeds	12750	10263
3	Fertilizers and pesticides	18548	13558

Table 1, Continued

No.	Name of items	Grains	Seeds
4	Current repairs, spare parts	714	7463
5	Amortisation	1431	16172
6	Fuels and lubricants	5950	9715
7	Other major expenses	6070	16649
	Total expenses	48829	97990

Source: compiled by the authors based on the data of Kazakh Scientific Research Institute for Economics of Agro-Industrial Complex and Rural Territories Development (2022)

Table 1 shows that the production cost of elite seed demonstrate two-fold increase of similar costs per 1 hectare of commercial grain crops. It should be noted that such items as amortization, current repairs and expenses on the seeds exceeds the cost of commercial grain by more than 10 times, and on wages by almost 9 times. The agricultural producers spend more in the production of commercial grain only on two items, in particular on the cost of seeds and the purchase of fertilizers and plant protection products. However, this still does not mean that the production of grain is more profitable than seed, since the data in Table 1 do not take into account the income the companies receive from the sale of these products, which will also be analysed below. Possible reasons for such significant discrepancy in costs are as follows. Unlike ordinary producers of agricultural products, the elite seed farms have better energy efficiency due to the specifics of production, which includes the need in agricultural machinery, seed-cleaning equipment, specialized threshing floors and storage facilities necessary to ensure a set of works on the production of the planned volume of elite seeds (Order of the ..., 2015).

On the other hand, the elite seed farms have lower seed expenses because they use crops from their own breeding facilities. Since the manufacturers use super elite seeds to produce elite seeds, their higher yields and resistance to plant diseases have positive impact on the cost of plant protection products. In addition, due to the greater energy efficiency compared to the average grain producers, the seed producers have more opportunities for using a full circle of necessary agro-technical measures. This increases costs for fuels and lubricants, payroll, and other expenses. In addition to information on expenditures, the survey of elite seed farms also provided data regarding the average yield of seed sown crops. The data show that the yield of seed producers significantly exceeds the regional average. Therefore, if in 2020 the yield of soft wheat in the North Kazakhstan region was 14.4 c/ha, it was at least 20.0 c/ha at the sown areas of elite seed farms.

Table 2 shows a comparative analysis of income and costs for the cultivation of 1 hectare of commercial grain and elite seeds of spring soft wheat.

Table 2. Comparative analysis of income and costs for the cultivation of 1 hectare of commercial grain and elite seeds of spring soft wheat

No.	Name of parameter	Calculation	Measurement unit	Producer of market grain	Elite seed growing farm
1	Yields	x	c/ha	14.4	20.0
2	Grain yield	x	c/ha	14.4	10.0
3	Seed yield	x	c/ha	0	10.0
4	Price per unit	x	KZT	8 000 (grain)	14000 (elite seeds)
5	Total revenue	((2*4.1) + (3*4.2))	KZT/ha	115200	220000
6	Total expense	(data from Table 1)	KZT/ha	48829	97990
7	Profit (income-expense)	(5-6)	KZT	66371	122010
8	Benefit-cost ratio	(7/6)		1.36	1.25

Note: x – the cell is not filled

Source: compiled by the authors based on the data of Kazakh Scientific Research Institute for Economics of Agro-Industrial Complex and Rural Territories Development (2022)

As can be seen from Table 2, the value of the profit indicator of the elite seed farm in relation to the producer of grain is higher by 84%, with a twofold increase

in costs. At the same moment, it is necessary to note a number of specific features common for seed producers. Nevertheless, the benefit-cost ratio of commercial grain

production is higher by about 11% than that of seed: thus, a unit of capital invested by the entrepreneur in this type of production will bring a relatively large return.

First, as mentioned above, is the higher yield per one hectare of area in elite seed farms: 20.0 cwt/ha instead of 14.4 cwt/ha. At the same time, authors note that part of the resulting crop usually does not meet the requirements of the seed culture (moisture, purity, etc.) and is sold as commercial grain. This paper assumes that at least 50% of the crop is sold as commercial grain. At the same time, according to the requirements for elite seed farms, the share of seed production in the total sown area should be at least 25% and the share of elite seed production in the total volume of production should also be minimum of 25% (Order of the..., 2015). Second, the higher cost of 1 quintal of elite seeds compared with 1 quintal of commercial grain (14000 KZT vs. 8000 KZT). The authors note that the main volume of seeds can be sold not in the autumn at the end of the harvesting campaign, but rather in the spring of the following year in preparation for the sowing season. This fact implies the delayed nature of the calculated profit. Third, elite seed farms need to produce not just seeds that meet the characteristics of the elite culture, the seeds must also be in demand among agricultural producers of seed varieties, and this imposes high demands on the processes of variety renewal and variety change.

DISCUSSION

In the article, the authors assess the current state of agriculture in the Republic of Kazakhstan. As mentioned by Kühling *et al.* (2017), the main factors that affect the development of agriculture in the country are climatic conditions, financial support from the state, global pricing, and investment attractiveness of the industry. Thus, F. Shulenbaeva *et al.* (2019) in their paper wrote about the investment attractiveness of Kazakhstan and mentioned that it is quite high, especially given the likely subsequent increase in government support of the industry by various methods, which will further increase the influx of investment. By this, it can be also understood certain prospects in terms of funding this industry at the country level. In terms of climate, as noted by A. Russell *et al.* (2018), the level of environmental friendliness in Kazakhstan varies greatly depending on the region: therefore, air and water quality can be worse in big cities than in rural areas. As for the situation in the world, COVID-19 crisis and other disasters also affect the agricultural companies: this was described in their paper by C. Elleby *et al.* (2020). They also noted that the pandemic was one of the causes of the price drop of many agricultural products. However, if you look at the price of the futures of many agricultural commodities, such as wheat, pork, and others, you can see that the existing price for the sector as of 2022 is more than favourable.

N.V. Vashukevich *et al.* (2021) conducted the estimation of land yields in Kazakhstan. In their opinion, despite the problems with yields and fertilizers, the potential of agricultural land in Kazakhstan remains high. However, scientists also mention that the country probably requires a new calibrated approach for development in the agricultural sector, as well as the creation of conditions for the processing of raw materials within the country and the involvement (development) of new agricultural technologies. Thus, in assessing the state of the above parameters of agricultural development in Kazakhstan, it can be noted that they are all at a high enough level, particularly given the governmental support for the industry. Despite the global crises driving up prices for many resources, including agricultural products, Kazakhstan's favourable climatic conditions make it a promising location for growing crops. Moreover, the country's increasing governmental support for the agricultural sector is likely to boost its investment appeal in the future. Although the level of environmental friendliness varies across regions, the areas suitable for cultivating crops are expected to have more favourable conditions.

Given that, the paper focused on the North Kazakhstan region, where it is important to assess how other scientists described the state of the agriculture in their works. Among these, authors mention A.V. Shurr (2014), who in his work described the development of the agro-industrial complex of North Kazakhstan region. As the author notes, the role of the agricultural sector in this area is due not only to high investments, but also to some social indicators: for example, a large part of the region's population (about 40%) lives in rural areas. In general, the scientist notes that high potential of the agricultural development in the region is not yet fully explored, especially in the context of grain culture growing. Probably, with deeper integration of Kazakhstan into international markets, the regional products could not only win their share, but also attract additional investments. In addition, A.V. Shurr (2014) examines the production of the agricultural sector of North Kazakhstan region in terms of districts and at a deeper level. For this purpose, several basic indicators were used, among them are the gross output of the agricultural sector, the sown area of all crops, the cost of output per quintal, the number of enterprises engaged in the agriculture and others. Thus, the scientist notes that the most profitable for the development of livestock are Kyzylzhar, Mamlutka, Magzhama Zhumabaeva districts, and for crop production, which has a clear preponderance both in levels of profitability and prevalence in the region, the districts are Kyzylzhar, Mamlyutka, Magzhama Zhumabaeva, Akkaiyn and Zhambyl. According to the author, another region worth mentioning is the Taiynsha region, where gross output in livestock and crop production are significant, as well as the Shal Akyn region, which has the lowest cost of

production per quintal. Besides, it would be important to estimate the share of grain crops in each of the districts, which, unfortunately, the author did not do.

E.Zh. Shorabaev (2009) in his work examines the opportunities for growing wheat in the North Kazakhstan region. The scientist notes that the most important problem for the development of the agriculture in the country, and particularly in this region, is the degradation of soils, caused by the use of outdated methods of cultivation and plowing land. This creates the need for a change in company policy on the environmental component of the agricultural sector. According to the scientist's opinion, one of the crops that could replace wheat in the future could be peas, given its adaptability to the conditions of particular region. Also interesting is the work of K. Abdullaev et al. (2020), which analysed the agriculture in the North Kazakhstan region in terms of innovative technologies, as well as the use of precision farming technology in the region. The scientists note that the introduction of innovative agricultural systems, especially precision farming technology, is very promising for the conditions of North Kazakhstan, because probably it could significantly increase the economic efficiency of the agricultural business in the region. Thus, the region does have significant potential for the agricultural development. However, the engagement of trained personnel will probably require governmental support and the introduction of innovative technologies should also be encouraged by the state (Gordon, 2019).

Thus, the analysis carried out in this paper demonstrates that the production of spring soft wheat seed compared with the manufacture of commercial grain in North Kazakhstan is much higher than the profitability of cultivation of 1 hectare of sown area. Besides, due to the specifics of the manufacturing process and sales of seed material, this task relies on capacity of the enterprises that have sufficient energy efficient machinery and fleet of agricultural machinery, storage tanks and seed-cleaning equipment, which also creates significant additional costs of doing business, especially in the short term. Therefore, this kind of production will become more relevant for manufacturers with large capitals and capabilities. Relying on the higher value of the benefit-cost ratio, small investors should probably invest in the production of commercial grain. However, another likely method of building production facilities under given conditions is to switch to the manufacture of commercial grain and seeds at the same time. By choosing this option (by diversifying personal business in this way), an investor will not only be able to generate a more predictable average level of income year after year, but also significantly reduce the risks in the event of unforeseen circumstances both in production and in the market for a specific product (in the event of

a price change for it, for example). Nevertheless, in such a case it is also valuable for the entrepreneur to make a certain transition in order to achieve the required level of energy efficiency.

CONCLUSIONS

The paper analysed the state of the agricultural sector in Kazakhstan and in particular in North Kazakhstan region. Authors demonstrated that the agricultural sector is one of the fundamentals of the country's economic development, as indicated by its relatively high share in the total GDP. In turn, one of the most important regions in the country is North Kazakhstan, the reason for which is its high share in the production of the country's agricultural sector. In addition, the assessment of the development rates of the industry showed an increase of 90% in the country as a whole and 109% in North Kazakhstan. The industry has also shown a high level of sustainability in terms of productivity levels, compared to the overall GDP; it is a promising sector for investment and is likely to grow strongly in the coming years.

The paper describes the profitability of different options for wheat production (commercial grains and elite seeds), with a comparative study of the economic analysis of spring wheat seed production in North Kazakhstan region. Authors have demonstrated that seed production is more profitable per unit area (one ha), while production of commercial grains is more profitable per unit of capital invested. Thus, entrepreneurs with considerable amount of funds should invest in spring wheat seeds, while smaller entrepreneurs should invest in commercial grains. Another reason for such conclusions is the different initial investment required for this business, which is much higher for seed production than for commercial grains. However, it is also acceptable to switch to combined production, i.e., both grains and seeds at the same time, which would achieve a more predictable and average level of enterprise profitability and to carry out risk diversification, as well as reduce initial investments in production. A follow-up study of the agriculture in its other areas, in particular Turkestan and other provinces should look promising.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Економічний аналіз насінництва ярої м'якої пшениці в Північно-Казахстанській області

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Анотація. У сучасних реаліях сільське господарство відіграє дуже важливу роль не тільки в досягненні сталого економічного розвитку, а й у вирішенні глобальної проблеми голоду та забезпеченні незалежності держави від зовнішніх поставок продовольства. Все це робить дану галузь важливим фактором для розгляду в багатьох країнах. У даній роботі автори зробили акцент на економічному аналізі окремих культур галузі, а саме ярої пшениці в Північно-Казахстанському регіоні. Таким чином, метою роботи був розрахунок економічної доцільності вирощування даної культури. Основним методом при написанні роботи був аналіз. Крім того, важливу роль відіграли статистичні методи дослідження, а також методи порівняння, моделювання, індукції та інші. У статті показано, що витрати на виробництво елітного насіння значно перевищують витрати на вирощування товарних посівів зернових культур у розрахунку на гектар. При цьому насінництво сприяє підвищенню прибутковості з гектара, проте спостерігається протилежна тенденція щодо ефективності на одиницю вкладеного капіталу, яка була вищою у виробників товарного зерна, ніж у насінництва. При цьому специфіка насінництва висуває підвищені вимоги до сільськогосподарських товаровиробників з точки зору енергоефективності, а саме забезпеченості машинно-тракторним парком та парком сільськогосподарської техніки, елеваторними потужностями, а також обладнанням для очищення зерна. Зроблено висновки щодо прийняття рішення підприємцями про інвестування у виробництво того чи іншого виду продукції. Стаття привносить нові знання для розуміння особливостей економічного розвитку Казахстану, особливо в регіональному аспекті та галузевій специфіці

Ключові слова: економіка Казахстану; регіональний розвиток; сільське господарство; підприємництво; інвестиції
