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COMPARATIVE CLUSTER ANALYSIS OF KAZAKHSTAN'S AGRICULTURAL POTENTIAL WITH WORLD COUNTRIES

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ABSTRACT

Purpose of the research. Is the study of the source of development of the agricultural sector of Kazakhstan – the place among the countries of the world in accordance with the volume and efficiency of the use of natural resources.

Methodology. In this regard, to determine the countries with which the level of development of the agricultural sector of Kazakhstan corresponds, 32 countries rich in agricultural natural resources are selected from 193 countries of the world, and for many indicators that characterize the effective use of natural potential, multidimensional statistics in two forms determined the location of clusters in computer technology using cluster analysis in a special SPSS program. In these two objects, a comparative analysis of the effectiveness of the use or return of natural resources of Kazakhstan with the countries included in the cluster was carried out.

Originality / value of the research. Among the countries rich in agricultural natural resources, agricultural data comparing Kazakhstan with indicators of productivity of the agricultural sector of the USA and Russia, analyzing the recoverability of the resource potential.

Findings. Resulting in the low production volumes compared to the volumes of natural resources of the country and not fully used all the wealth.

Keywords: agricultural potential, natural resource, world countries, cluster analysis, SPSS program.

INTRODUCTION

The agricultural sector is one of the “locomotives” that allows Kazakhstan to enter the world development path. Therefore, the improvement and development of the agricultural sector for Kazakhstan is an advanced task and a way to develop the national economy. This was stated in the message of the first President of the country Nursultan Nazarbayev to the people of Kazakhstan on October 5, 2018 “Growing the welfare of Kazakhstanis: increasing income and quality of life”.

In the Address of the First President of the Republic of Kazakhstan the main goal is to increase labor productivity and export of processed agricultural products by 2.5 times by 2022 [1].

Today, 40 % of some food consumed in Kazakhstan is provided by imports. Almost all products imported from outside, processed finished products and they were spent on an average of 1.8 billion USA dollars annually. Therefore, first of all, there was a need to form large-scale farms in the domestic agronomist, aimed at adopting a set of advanced agrotechnical measures and ensuring the technological process from the “field to the consumer”. Time has proved that only enterprises with great potential can implement innovative technologies and the results of scientific projects.

For the sustainable development of agricultural production, Kazakhstan has a large number of competitive advantages, in particular, natural resources and sufficient state support, but still depends on food imports and cannot provide employment for the rural population. In particular, the country coincides with the volume of farmland in Russia, and with the land-with Australia. And the use of these natural resources is 7-8 times less than in Russia, and 3-4 times less than in Australia [2].

In this regard, the state program of development of agriculture of the Republic of Kazakhstan for the years 2017-2021 defined specific solutions: “Increase in labor productivity by 38 % in 2021 compared to 2015, increase in gross output by 30 %, increase exports to 600 million US dollars, increase food wholesale sales by 29 %, these indicators will help the agribusiness. increase the competitiveness of the industry”.

At the final meeting of the State Commission for emergency situations on May 11, 2020, President K. Tokayev instructed the Government, together with the National chamber “Atameken”, to launch a pilot project for the development of cooperative chains in villages "from field to shelf" in the regions, which is the main problem for the country's security in General in the current global crisis [3].

Having set such tasks, a comparison was made with 32 countries in order to determine the place of return of the country's agricultural resources potential between the world countries. To do this, we conduct a comparative analysis of the level of use of Kazakhstan's own natural resources by consolidating several economic indicators on the basis of a special computer program SPSS-22 using multidimensional statistics–mathematical methods, including methods of cluster analysis.

Literature review. Studying the issues of economy and organization of agricultural cooperatives in the agricultural sector in recent years, small-scale production, ways to solve this problem, we see the articles of the scientists T. I. Espolov, U. K. Kerimova, G. R. Madiyev. It is necessary to voluntarily combine small-scale economic sources to eliminate small-scale production, limited use of innovative technologies and increase the productivity and competitiveness of small farms in the agricultural sector. Today, “the reason for inequality is the lack of stimulating economic and other mechanisms for rural residents who have shares” [4].

We agree with the opinion of academician A. Satybaldin that the failure of the country's agricultural sector should consist of economic, technological, technical policies and organizational measures due to the lack of integrity of the agricultural policy. In General, the resource potential of the agricultural sector in comparison with world-class research, including Henrie M., & Sousa-Poza A. the study conducted a comparative analysis of publication activity based on the Scopus indexation database. When analyzing scientific articles about agricultural potential in the last 2010-2019 years, the activity of researchers based on publications prevails in the following countries. In China – 77, the USA – 24, Japan – 23. Among the fields of education, this issue can be called 2 % of agricultural industries, for example, 21 % of social science; 12 % of engineering; 10 % of business; 14 % of computer science. According to the results of research in the agricultural sector, there is a lack of scientific research on this topic [5].

MAIN PART OF A STUDY

Currently, the country's agricultural land according to 2017 data is 216,9 (80,4 %) million hectares, including arable land – 29,4 (10,9 %) million hectares. Kazakhstan ranks 5th among the world's countries in total agricultural land, before China, the United States, Australia, Brazil, and then-6th place Russia. The country is an agricultural country, since 80 % of all land is suitable for the agricultural sector, the third place in the world, including pastures of 187 million hectares, that is, it is convenient for animal husbandry. If we compare two countries with the United States and Russia with the main agricultural indicators on the world stage, they occupy such places as the production of agricultural products in accordance with the land. In addition, depending on the productivity of land use in these countries, data related to the volume of gross production of cereals and meat are collected. Let's analyze these indicators (table 1).

For example, the United States ranks second in the world in terms of land area, and the same in terms of agricultural production ranks 2-3. Russia is also 2-3 places lower than in line with the earth. Kazakhstan occupies the 5th place in agricultural land, and in production, especially livestock on the 47th place, that is 42 times lower. And in terms of seeding areas, the 13th place is 54th in terms of crop production. The USA is a country with advanced technology, so it is more difficult to compare with our country than with Russia, although the production volume is 10 times lower.

As for food products produced per capita, Kazakhstan produces a large number of cereals, i.e. it provides a sufficient amount per capita and exports. Among the products, it can be noted that livestock products are not produced at the proper level. Only the US will fully provide its population, Russia and Kazakhstan provide about 50 % of the required rate, and the rest is supplemented by imports.

Table 1 – Global comparability of Kazakhstan's agricultural potential (2017)

Indicators	USA		Russia		Kazakhstan	
	volume	place	volume	place	volume	place
Resource potential						
Agricultural land, area million ha	405,5	2	216,2	6	216,9	5
share from all places, %	44,5	80	13,3	162	80,4	3
Arable land, million hectares	157,8	1	121,6	3	29,4	13
share from all places, %	16,6	59	7,5	119	10,9	95
Agricultural products, billion US dollars: including						
Crop production	189	3	41	9	6	54
Livestock breeding	141	2	32	6	4	47
Food production per capita, kg						
Grain crop	1211	5	544	24	1089	6
import	26	141	15	152	15	154
export	314	11	97	30	401	8
Meat	132	9	37	62	52	41
import	7	80	20	40	12	60
export	16	23	0,4	73	0,1	102
Products from 100 ha						
Grain crops per 100 ha, tons.	279		108		68	
Meat calculated for 100 ha of agricultural land, tons.	11		4,8		0,5	
Note – calculated from the source [2; 6; 7]						

Thus, in comparison with the efficiency of using the main agricultural resources, the US collected 279 tons of grain per 100 ha, Russia-108 tons, Kazakhstan-68 tons less than 4 times. This means that grain crops have a low yield, which will increase the cost of production, and export revenues are also low. As you know, low crop yield has land fertility, non-compliance with agrotechnological requirements, and other reasons. And you can see that meat products in Russia are two times lower than in the United States, and in Kazakhstan they are 20 times lower. This indicates that the main resource in Kazakhstan can not effectively use the land, and it is noted that animal husbandry is on the industrial plan.

If we compare it with 32 countries with high agricultural potential, the 5th place is occupied by farmland, including more than 80 % of pastures suitable for animal husbandry. And of the 235 million hectares of farmland in Brazil (4th place), 27,7 million tons of meat are extracted, the 3rd place from these countries, and Kazakhstan is 23rd in the production of 1 million tons of meat. Uzbekistan is on the 24th place with the volume of meat production of 25 million (10 times less). With an area of arable land, the country is ranked 11th, ahead of Pakistan (31,2 million hectares, 9th place), Australia (30,8 million hectares, 10th place). If you look at the efficiency of arable land use, Kazakhstan produced 20.1 million tons of grain and the 18th place, while Australia produces 50 million tons of grain (9th place), Pakistan – 44,1 million tons (11th place). In these countries, the area and production of land coincide, so it is clear that the available resources are being used effectively. Land resources are not depleted by wealth and other resources, but only normative technologies of use should be preserved.

Now, in order to find out the level of development of Kazakhstan depending on this main resource – land at the level of countries using the mathematical method – cluster analysis, we will analyze the statistical information contained in this table with a special computer program SPSS–22. The cluster analysis method can also be used for correlation analysis. cluster analysis is the simplest and most visual analog of factor analysis for studying the relationship of many variables [6; 7]. In this sense, there is an Arab interest in factor and cluster analysis.

A big advantage of cluster analysis is that objects can be grouped by a whole set of attributes rather than by a single parameter [8].

In addition, cluster analysis, unlike many mathematical and statistical methods, does not give any restrictions on the type of objects under consideration and allows you to freely view many of the source data [9; 10]. Cluster analysis allows you to consider the volume of multidimensional information and quickly reduce and minimize large amounts of socio-economic information [11; 12].

When making the report, we stopped at 2 options. Indicators included in the first option: Agricultural area, million ha; arable land, million ha; crop yield, million tons, meat products, million tons. In the second option: grain crop yield, million tons, meat products, million tons.

As a result of computer calculations, the authenticity of group clusters can be seen in table 2 below. At the same time, the last column indicates that the Fisher criterion is significantly higher than the table value F ($F=2.7$) and the value ($p=0.05$) is very lower than the accepted value. Therefore, you can analyze the resulting groupings [13; 14].

Table 2 – Variance analysis Indicators

Variable	Analysis of Variance (CLUSTER=AGRO)					
	Between SS	df	Within SS	df	F	Signif. p
1	2	3	4	5	6	7
Agricultural area (million hectares)	25,84	2	5,16	29	72,55	0,0000
Arable land (million hectares)	23,54	2	7,45	29	45,81	0,0000
Cereals production quantity (million tonnes)	27,47	2	3,53	29	112,75	0,0000
Total production of meat (million tonnes)	26,44	2	4,56	29	83,98	0,0000
Note – the result released on the basis of the computer program SPSS–22						

In the first version, the agricultural indicators of the countries under consideration: agricultural area, million ha (AA); sown area, million ha (SA); crop yield, million tons (CY), meat products, million tons (MP). As a result, 32 countries were grouped into three clusters (table 3).

Table 3 – Comparison with the average cluster values of the first option

Countries in the cluster	Number of countries	AA, million ha	SA, million ha	CY, million tons	MP, million tons
Cluster 1: China, USA	2	466,5	138,6	529,6	66,1
Cluster 2: Australia, Brazil, Russia, India	4	250,2	91,05	153,1	12,4
Cluster 3: Kazakhstan, Saudi Arabia, Argentina, Mexico, South Africa, Canada, Iran, Colombia, Ukraine, Algeria, Turkey, Afghanistan, Bolivia, Pakistan, Turkmenistan, France, Spain, Uzbekistan, Great Britain, Germany, Poland, Romania, Italy, Kyrgyzstan, Malaysia, Azerbaijan	26	47,0	13,5	22,1	2,9
Average General meeting	32	254,6	81,1	234,9	27,1
Kazakhstan		216,9	29,4	20,1	1,0
Note – compiled by the authors					

According to 4 indicators of the studied 32 countries were grouped into 3 clusters. According to the results of country consolidation, Kazakhstan is in the group of 3 clusters consisting of 26 countries. Unfortunately, agriculture should be in the second cluster for land resources. The volume of meat products from these clusters is 12 times less. And the sown area is three times less, but the grain yield is 7,5 times less. The average agricultural Area of the third group of countries is 47 million hectares, which is 5 times less than our country, and the volume of meat produced is three times less, and the sown area is more than twice, but the volume of grain crops collected is approximately.

Compared to intra-cluster countries, the volume of grain production with Iran and Kazakhstan is approximately half the size of the land area. And in Pakistan, the acreage, although 2 times more than 2 times, and 4 times more than in Pakistan. As a result, there is a full effective use of the available resource potential and we see low productivity. In 2018, in comparison with 189 countries of the world, we placed on the 109th place with 1 hectare of wheat, collected 12,3 C per 1 ha [1].

This indicates the high potential of the main land resources in the country and the possibility of increasing the export potential, as well as providing the country with full-fledged food. In General, in the world, depending on the area of farmland, taking the 3rd place in terms of food supply of the country, the second option was grouped by the volume of grain and meat production. In this version, the countries are divided into 4 clusters and Kazakhstan again took the 4th place with the minimum indicator (table 4).

Table 4 – Comparison with the average values of countries in clusters of the second option

Countries in the cluster	Number of countries	Cereal products, million tons	Meat products, million tons
Cluster 1: China, USA	2	529,6	66,1
Cluster 2: Brazil, Russia, India	3	187,5	15,1
Cluster 3: Australia, Argentina, Mexico, Canada, Turkey, Kazakhstan, France, Spain, Germany, Poland	10	45,9	5,4
Cluster 4: Kazakhstan, Saudi Arabia, South Africa, Iran, Colombia, Ukraine, Algeria, Afghanistan, Bolivia, Turkmenistan, Uzbekistan, Great Britain, Romania, Italy, Kyrgyzstan, Malaysia, Azerbaijan	17	10,1	1,6
Average General meeting	32	193,3	22,0
Kazakhstan		20,1	1,0
Note – compiled by the authors			

In this version, Kazakhstan entered the 4th cluster due to low meat production volumes. Natural resource potential of the countries in these clusters are in General twice as less and less agricultural land. From this it is known that the development of animal husbandry in Kazakhstan does not have a steady pace. The natural conditions of Kazakhstan are favorable for the development of animal husbandry. Kazakhstan traditionally has a great potential for breeding sheep, horses, camels and cattle. Low competition of the livestock industry its production is mainly concentrated in households with 63 % of cattle, in peasant (farm) farms – 28,9 % and agricultural enterprises – 8,1 %.

During these years of independence, the number of livestock has almost halved and has now reached 6,8 million heads. At the same time, imports of meat products in 2000 amounted to 39,9 thousand tons, in 2017 – 612 thousand tons.

At the same time, there is low agricultural productivity, which can be seen when comparing the level of use of natural resources with 32 countries. The use of natural resources in Kazakhstan ranks 27th in terms of the area of harvested grain on the entire area of arable land (29,4 million ha), and 31st in terms of the area of produced meat on the area of farmland (216,9 million ha). The first countries that fully use these natural resources, including those that harvested more than 1 hectare, include China – 51,8 c, Germany – 38,6 c, Great Britain – 37,9 c, France – 37,1 c, Uzbekistan – 33,3 c. and in General, 1 ha of agricultural land is most fully used by livestock, including the first countries: Germany – 497,0 kg, Poland – 296,6 kg, Italy – 289,1 kg, Spain – 251,0 kg.

RESEARCH RESULTS (CONCLUSION)

The transition of the country's agricultural sector to a sustainable development path is associated with the effective use of natural resources in this industry [15; 16].

During the transition to the market, the export potential of grain products in agriculture in the shortest possible time led to success, replacing livestock. In this regard, the Republic has for many years sown common grain crops on agricultural land, reduced the fertility of crops due to violations of agrotechnological requirements and reduced the production potential of livestock.

Due to the need to meet agrotechnical, veterinary, engineering and technological requirements, in addition to economic factors to the parameters of the development of the crop and livestock industry, the largest branch of the agricultural sector does not exclude an inefficient industry from the production structure of the industry. In any case, the strategic decision is determined by a combination of factors. first of all, it is necessary to provide for a long-term sustainable use of the available resource potential.

In particular, in grain production, forage plants will be grown according to agrotechnological requirements in order to preserve land fertility in the crop rotation. And the basis for the development of animal husbandry is the feed Fund. Therefore, the development of the agricultural sector is advisable to combine specialization and concentration in different directions and scales. In all cases, agriculture and animal husbandry must find their harmonious combination.

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ҚАЗАҚСТАННЫҢ АГРАРЛЫҚ ӘЛЕУЕТІНЕ ӘЛЕМДІК ЕЛДЕРМЕН САЛЫСТЫРМАЛЫ КЛАСТЕРЛІК ТАЛДАУ

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АНДАТПА

Зерттеудің мақсаты. Қазақстанның аграрлық секторының даму көзі – табиғи ресурстарының көлеміне және пайдалану тиімділігіне сәйкес әлем елдерінің арасында алатын орнын зерттеу.

Зерттеудің әдіснамасы. Қазақстанның аграрлық секторының даму деңгейі қай елдермен сәйкес келетінін анықтау үшін әлемдік 193 елдің ішінен аграрлық табиғи ресурсқа бай 32 елді таңдап алып табиғи әлеуетті тиімді пайдалануын сипаттаушы көптеген көрсеткіштерге екі нысанда көпөлшемді статистика математикалық әдістердің ішіндегі кластерлік талдау әдісімен компьютерлер технологиясында арнаулы SPSS-22 бағдарламасында топтастыру арқылы кластерлерге бөліп орны анықталған. Осы екі нысанда кластерге енген елдермен Қазақстанның табиғи ресурстарын тиімді пайдалану, немесе қайтарымдылығын салыстырып талдау жасалған.

Зерттеудің бірегейлігі / құндылығы. Ауыл шаруашылығына жарамды табиғи ресурстарға бай елдердің ішінде АҚШ пен Ресейдің аграрлық секторының өнімділігін сипаттайтын көрсеткіштерімен Қазақстанның аграрлық мәліметтерін салыстырып, ресурс әлеуетінің қайтарымдылығына талдау жасалынған.

Зерттеу нәтижелері. Нәтижесінде, еліміздің табиғи ресурстары көлеміне қарағанда өндіріс көлемінің төмендігі анықталды және бар байлықты толық пайдалана алмай отырғандығы негізделген.

Түйін сөздер: аграрлық әлеует, табиғи ресурс, әлемдік елдер, кластерлік талдау, SPSS бағдарламасы.

СРАВНИТЕЛЬНЫЙ КЛАСТЕРНЫЙ АНАЛИЗ АГРАРНОГО ПОТЕНЦИАЛА КАЗАХСТАНА СО СТРАНАМИ МИРА

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АННОТАЦИЯ

Цель исследования. Рассмотреть положение аграрного сектора Казахстана среди стран мира по объему природных ресурсов и эффективности их использования.

Методология. Чтобы определить, какие страны соответствуют уровню развития аграрного сектора Казахстана, из 193 стран были отобраны 32 страны, богатые аграрными природными ресурсами и проведена кластеризация в программе SPSS–22. Таким образом, проведен сравнительный анализ рационального использования или эффективности природных ресурсов Казахстана со странами, включенными в кластер.

Оригинальность / ценность исследования. Среди стран, богатых сельскохозяйственными природными ресурсами, проведен анализ доходности ресурсного потенциала, сопоставление сельскохозяйственных данных Казахстана с показателями, характеризующими производительность сельскохозяйственного сектора США и России.

Результаты исследования. В результате выявлены низкие объемы производства по сравнению с объемами природных ресурсов страны и обусловлены тем, что не в полной мере используются имеющиеся ресурсы страны.

Ключевые слова: сельскохозяйственный потенциал, природные ресурсы, страны мира, кластерный анализ, программа SPSS.

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СТРУКТУРНЫЕ СДВИГИ В ОБРАБАТЫВАЮЩЕЙ ПРОМЫШЛЕННОСТИ КАЗАХСТАНА

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АННОТАЦИЯ

Цель исследования. Проанализировать структурные изменения в обрабатывающей промышленности Казахстана на основе расчета коэффициента абсолютных структурных сдвигов за 1990-2019 гг. и выявить связь с темпами роста экономики страны.

Методология. В статье авторами обобщен международный опыт исследований в данной области, в частности Л. Казинца, J. Fagerberg, S. Feldman, D. McClain, K. Palmer, R. Howarth, L. Schipper, P. Duerr, S. Strom, J. Ferraz, D. Kupfer, F. Serrano, C. Chandrasekhar, M. Hayashi, C. Perez, А. Лякина, С. Глазьева, В. Полтеровича, исследователей Высшей школы экономики (Москва). Процесс познания осуществлен по принципу «вход-выход»: исходя из эмпирического исследования и расчетов на основе количественных данных Комитета по статистике Казахстана, а также логического анализа полученных результатов расчетов, выявления взаимосвязи экономических показателей.

Оригинальность / ценность исследования. Проведенный анализ, по мнению авторов, более объективно отражает изменения в структуре обрабатывающей промышленности Казахстана и может использоваться для дальнейших исследований в данной области.