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DYNAMICS AND EFFICIENCY OF AGRICULTURE IN KAZAKHSTAN

The article examines the dynamics of the development of agriculture in Kazakhstan in the context of ensuring food security. The methodological basis of the study was based on methods of comparative and dynamic analysis, calculation of absolute and relative indicators of change, as well as elements of structural analysis based on official statistical data.

The key indicators of the agricultural sector, including the area of agricultural land, gross value added and land productivity for the period 2010-2024 are analyzed. Differences in medium- and long-term development trends have been identified, as well as structural features of changes in the resource base and performance indicators.

It is shown that the expansion of land resources is accompanied by higher growth rates of value and production indicators, which indicates the transition of the agricultural sector from an extensive to an intensive development model. It has been revealed that the key factor in increasing sustainability is the growth of agricultural land productivity, reflecting the efficiency of resource use. The presence of an imbalance between the dynamics of the resource base and performance indicators has been determined, which indicates the need to improve the management mechanisms of the industry.

A model of the relationship between the resource base, economic dynamics and agricultural efficiency is proposed, which makes it possible to systematize the identified trends. It is shown that its use provides a rationale for improving the efficiency of agricultural production, including technological modernization, digitalization and human capital development.

Keywords: *agriculture, food security, land productivity, gross value added, agricultural sector, resource efficiency, development dynamics.*

Кілт сөздер: *ауыл шаруашылығы, азық-түлік қауіпсіздігі, жер өнімділігі, жалпы қосылған құн, аграрлық сектор, ресурстарды пайдалану тиімділігі, даму динамикасы.*

Ключевые слова: *сельское хозяйство, продовольственная безопасность, производительность земель, валовая добавленная стоимость, аграрный сектор, эффективность использования ресурсов, динамика развития.*

Introduction. In modern conditions of ensuring food security and sustainable economic development, the study of the dynamics of agriculture as a key sector of the national economy is of particular importance. The increasing influence of climatic, economic and institutional factors necessitates the transition from an extensive development model based on expanding the resource base to an intensive one focused on improving the efficiency of using available resources. In this regard, the task of a comprehensive analysis of the relationship between resource, cost and performance indicators of the agricultural sector is being actualized.

The scientific problem of the study is the lack of elaboration of a systematic approach to assessing the development of agriculture, which simultaneously takes into account changes in the resource base, economic results and the effectiveness of their use. In existing research, these aspects are usually considered in isolation, which limits the possibility of forming a holistic view of the trends and patterns of industry development.

The purpose of the study is a comprehensive assessment of the dynamics of key indicators of agriculture in Kazakhstan and the identification of relationships between the resource base, economic results and the effectiveness of their use. To achieve this goal, the following tasks have been solved:

- the analysis of the dynamics of the main indicators of the agricultural sector is carried out;
- differences in medium- and long-term development trends are identified; structural features of changes in the efficiency of agricultural resource use are identified;
- the model of interrelation of key factors of agricultural development is substantiated.

The methodological basis of the research consists of methods of comparative and dynamic analysis, calculation of absolute and relative indicators of change, as well as elements of structural analysis. The official statistical data of the Bureau of National Statistics of the Republic of Kazakhstan is used as an information base. Data processing was carried out using well-known statistical methods for analyzing dynamic series, ensuring comparability of indicators over time and reproducibility of the results obtained.

Thus, the presented research is aimed at forming a systematic understanding of the development of agriculture and identifying the factors determining its effectiveness in modern conditions.

Literature review. Modern research on the agricultural sector in Kazakhstan focuses on the relationship between the dynamics of agricultural production and food security. A number of works have examined trends in the development of the agricultural sector and shown that the sustainability of the food system is largely determined by structural changes in agriculture and resource efficiency [1]. International studies emphasize the importance of an integrated approach that includes energy, environmental, and economic factors that affect sustainable growth and food security [2].

A separate area of research is related to the influence of climatic factors on agricultural production. It has been established that changing climatic conditions have a significant impact on the yield and stability of agricultural production, increasing the risks of food security [3]. At the same time, regional studies reveal significant differences in food availability and the level of agricultural development, due to socio-economic and infrastructural factors [4].

A number of works have substantiated strategic directions for the development of the agricultural sector, including the need to modernize production, increase resource efficiency, and introduce innovative technologies [5]. Special attention is paid to the use of digital and analytical methods, including machine learning and yield forecasting, which makes it possible to increase the accuracy of management decisions [6]. It has also been shown that changes in production conditions significantly affect the level of productivity and require adaptation of agricultural policy [7,8].

Despite the significant contribution of existing research, the issues of a comprehensive assessment of the relationship between the resource base, economic results and agricultural efficiency remain unresolved. In most works, these aspects are considered in isolation, which limits the possibility of forming a systematic view of the development of the agricultural sector. This necessitates further research aimed at integrating these factors and developing models to assess the transition from an extensive to an intensive model of agricultural development.

The main part. In the context of increasing demands on food security and the sustainability of agricultural production, a comprehensive analysis of the dynamics of key agricultural indicators is of particular importance. The assessment of changes in the resource base, cost results and efficiency of the use of production factors allows us to identify the nature of the development of the agricultural sector and determine its structural features. The dynamics and changes in the main indicators of agriculture in Kazakhstan for the period 2010-2024 are presented in Table 1.

Table – 1

Dynamics and changes in key indicators of agriculture in Kazakhstan for 2010-2024

Indicator	Years							Change, +/-	
	2010	2015	2020	2021	2022	2023	2024	2024/ 2015	2024/ 2010
Agricultural land area, million hectares	93.73	100.84	108.56	113.96	115.97	116.45	117.12	16.28	23.39
GVA in agriculture, forestry and fisheries, billion tenge	1409.1	1925.8	3808.8	4222.7	5444.7	4568.6	5306.8	3381	3897

Productivity of agricultural lands, thousand tenge/ ha	10.5	19.1	35.1	37.1	47.0	39.2	45.3	26.2	34.8

** compiled from the source [8]*

The analysis of the data presented in Table 1 shows that the development of the agricultural sector is characterized by a steady expansion of the resource base and a significant increase in cost indicators. The area of agricultural land increased from 93.73 million hectares in 2010 to 117.12 million hectares in 2024, which indicates the gradual involvement of additional land resources in economic turnover. At the same time, over the medium-term period (2015-2024), the increase amounted to 16.28 million hectares, while over the long-term period (2010-2024) - 23.39 million hectares, reflecting a slowdown in the pace of extensive growth in recent years.

Gross value added in agriculture, forestry and fisheries shows a significantly higher rate of increase compared to the expansion of land resources. During the analyzed period, this indicator increased from 1,409.1 to 5,306.8 billion tenge, providing an absolute increase of 3,897 billion tenge. Particularly intensive growth is observed in the medium term, where the increase amounted to 3381 billion tenge, which indicates an increase in economic activity and an increase in the contribution of the agricultural sector to the national economy.

The most significant changes were recorded in terms of agricultural land productivity. The increase from 10.5 to 45.3 thousand tenge per hectare indicates a more than fourfold increase in the efficiency of land use. At the same time, the dynamics of this indicator has been characterized by a certain volatility in recent years, which may be due to the influence of external factors, including climatic conditions and market conditions.

A comparison of the dynamics of the indicators allows us to conclude that the agricultural sector is moving from a predominantly extensive development model to a more intensive one based on increased productivity and increased economic returns on resources. At the same time, the revealed fluctuations indicate the need for a more detailed analysis of growth rates and sustainability.

In this regard, for a more visual comparison of the intensity of changes, it is advisable to consider the relative indicators reflecting the growth rates of key agricultural parameters shown in Figure 1.

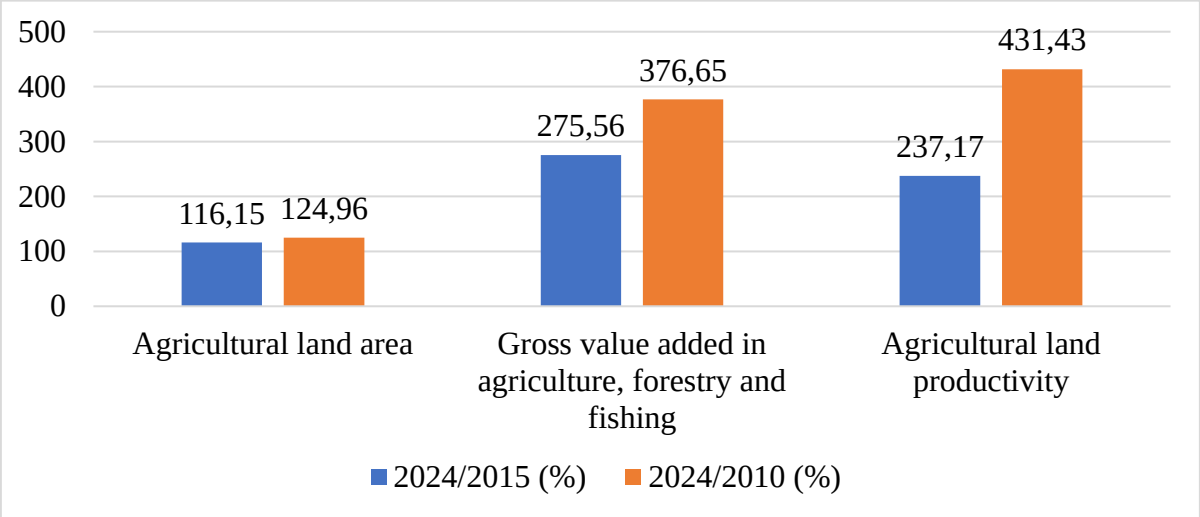

Figure – 1. **Growth rates of key indicators of agriculture in Kazakhstan, %***

**compiled from the source [9]*

The analysis of relative indicators in Figure 1 confirms the previously identified trends and allows for a clearer assessment of the intensity of structural changes in the agricultural sector. The highest growth

rates are observed in terms of agricultural land productivity: in the long term (2024/2010), the value exceeds 430%, and in the medium term (2024/2015) - more than 230%. This indicates a significant increase in the efficiency of land use and the strengthening of the role of intensive development factors

Gross value added also shows significant growth, exceeding 370% in the long term and 270% in the medium term. This dynamic reflects the expansion of the economic potential of the agricultural sector and the increase in its contribution to the formation of gross domestic product. At the same time, the growth rate of the output value outstrips the dynamics of the resource base, which indicates an increase in the return of the factors of production used.

In contrast to the value and production indicators, the area of agricultural land is characterized by moderate growth rates - about 125% in the long term and 116% in the medium term. This confirms the limitations of extensive development factors and indicates the exhaustion of the potential of a simple expansion of land resources.

A comparison of the growth rates allows us to conclude that Kazakhstan's agricultural sector is developing a trend towards a transition from an extensive to an intensive development model, in which increasing productivity and resource efficiency is of key importance. At the same time, an imbalance is revealed between the dynamics of the resource base and performance indicators, which requires a systematic approach to managing the development of the industry.

To summarize the identified relationships and identify areas for improving agricultural efficiency, it is advisable to consider a conceptual model reflecting the interaction of resource, economic and efficiency factors, shown in Figure 2.

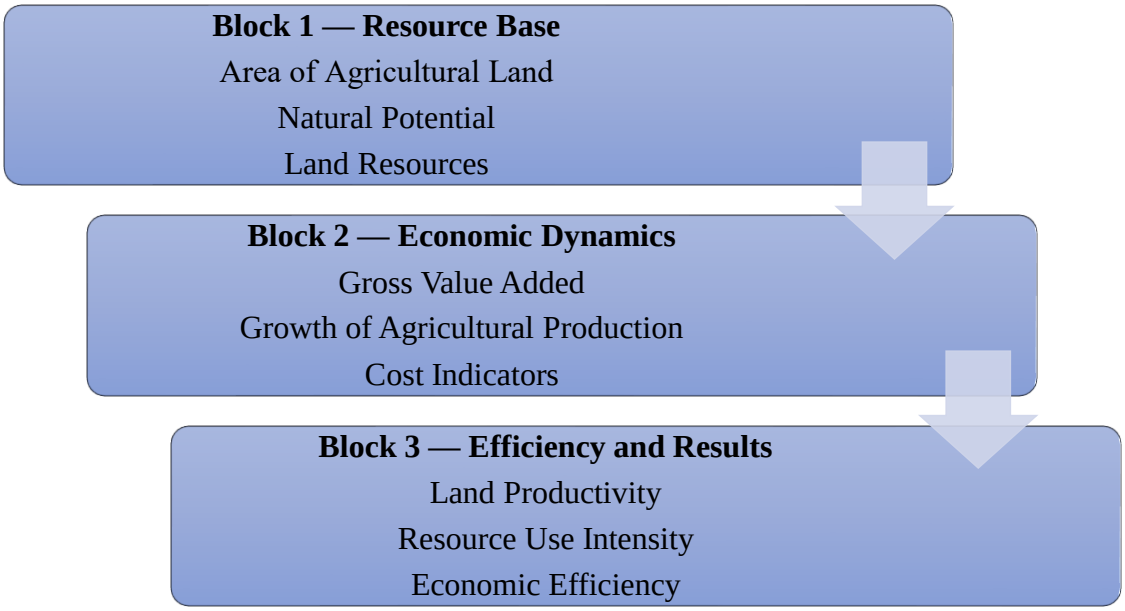

Figure – 2. **Logical model of the interrelation of the resource base, economic dynamics and efficiency of agriculture in Kazakhstan***

**compiled by the authors*

The model proposed in Figure 2 reflects the systemic logic of the functioning of the agricultural sector, in which the development of agriculture is considered as the result of the consistent interaction of three key areas.

The first area includes the resource base represented by agricultural lands, which form the basic potential of agricultural production.

The second direction characterizes the economic dynamics expressed in terms of gross value added, reflecting the level of resource involvement in economic turnover and the degree of development of production activities.

The third area is represented by performance indicators, primarily land productivity, which acts as an integral indicator of the effectiveness of using the resource base.

The logic of the model is based on the fact that the quantitative expansion of resources alone does not ensure sustainable growth, while increasing the efficiency of their use becomes a key factor in development. The analysis showed that in Kazakhstan there is a shift in emphasis from extensive expansion of land resources to intensive growth based on increased productivity and economic returns.

The priorities include technological modernization of agricultural production, the introduction of digital solutions in the management of agricultural processes, the development of human capital and the improvement of the institutional environment. Of particular importance is the integration of digital technologies to improve the accuracy of resource management, optimize production processes and reduce the impact of external factors, including climate risks.

The practical significance of the proposed model lies in the possibility of its use in the development of strategies for the development of the agricultural sector, the formation of state policy in the field of food security and improving the efficiency of the use of natural resources. The model can serve as a tool for substantiating management decisions aimed at ensuring sustainable and balanced development of agriculture in Kazakhstan.

Conclusion. The study made it possible to assess the dynamics of agricultural development in Kazakhstan based on an analysis of land area, gross value added and productivity for 2010-2024. It is revealed that the growth of cost and performance indicators outstrips the expansion of the resource base, which indicates the transition of the agricultural sector to an intensive development model. It is determined that the key factor of sustainability is an increase in land productivity, reflecting the efficiency of resource use. An imbalance has been revealed between the limitations of extensive growth and the increasing role of intensive factors. The proposed model of the relationship between the resource base, economic dynamics and efficiency forms the basis for system management of the industry development. The practical significance of the results is related to the possibility of their use in shaping public policy and improving the efficiency of the agricultural sector. In the future, it is advisable to conduct a regional analysis, as well as the use of methods of modeling and forecasting agricultural development.

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ҚАЗАҚСТАН АУЫЛ ШАРУАШЫЛЫҒЫНЫҢ ДИНАМИКАСЫ МЕН ТИІМДІЛІГІ

Аңдатпа

Мақалада азық-түлік қауіпсіздігін қамтамасыз ету тұрғысынан Қазақстанның ауыл шаруашылығының даму динамикасы қарастырылған. Зерттеудің әдіснамалық негізі салыстырмалы және динамикалық талдау әдістері, өзгерістің абсолютті және салыстырмалы көрсеткіштерін есептеу, сондай-ақ ресми статистикалық мәліметтер негізінде құрылымдық талдау элементтері болды. 2010-2024 жылдар кезеңіндегі ауыл шаруашылығы жерлерінің ауданын, жалпы қосылған құн мен жер өнімділігін қоса алғанда, аграрлық сектордың негізгі көрсеткіштері талданды. Жер ресурстарының кеңеюі құндық және өндірістік көрсеткіштердің өсу қарқынының жоғарылауымен қатар жүретіні көрсетілген, бұл аграрлық сектордың экстенсивтіден қарқынды даму моделіне көшуін көрсетеді. Тұрақтылықты арттырудың негізгі факторы ресурстарды пайдалану тиімділігін көрсететін ауыл шаруашылығы жерлерінің өнімділігінің өсуі болып табылатыны анықталды. Ресурстық база динамикасы мен нәтижелі көрсеткіштер арасындағы теңгерімсіздіктің болуы анықталды, бұл саланы басқару тетіктерін жетілдіру қажеттігін көрсетеді. Анықталған тенденцияларды жүйелеуге мүмкіндік беретін ресурстық базаның, экономикалық динамиканың және ауыл шаруашылығының тиімділігінің өзара байланысының моделі ұсынылды. Оны пайдалану

технологиялық жаңғыртуды, цифрландыруды және адами капиталды дамытуды қоса алғанда, аграрлық өндірістің тиімділігін арттыру бағыттарының негіздемесін қамтамасыз ететіні көрсетілген.

Набиева М.Т., Сыздыкова Э.Ж., Матаева Б.Т., Жанна К.

ДИНАМИКА И ЭФФЕКТИВНОСТЬ СЕЛЬСКОГО ХОЗЯЙСТВА КАЗАХСТАНА

Аннотация

В статье рассмотрена динамика развития сельского хозяйства Казахстана в контексте обеспечения продовольственной безопасности. Методологическую основу исследования составили методы сравнительного и динамического анализа, расчёт абсолютных и относительных показателей изменения, а также элементы структурного анализа на основе официальных статистических данных.

Проанализированы ключевые показатели аграрного сектора, включая площадь сельскохозяйственных земель, валовую добавленную стоимость и производительность земель за период 2010-2024 гг. Выявлены различия среднесрочных и долгосрочных тенденций развития, а также определены структурные особенности изменения ресурсной базы и результативных показателей.

Показано, что расширение земельных ресурсов сопровождается более высокими темпами роста стоимостных и производственных показателей, что свидетельствует о переходе аграрного сектора от экстенсивной к интенсивной модели развития. Выявлено, что ключевым фактором повышения устойчивости выступает рост производительности сельскохозяйственных земель, отражающий эффективность использования ресурсов. Определено наличие дисбаланса между динамикой ресурсной базы и результативных показателей, что указывает на необходимость совершенствования механизмов управления отраслью.

Предложена модель взаимосвязи ресурсной базы, экономической динамики и эффективности сельского хозяйства, позволяющая систематизировать выявленные тенденции. Показано, что её использование обеспечивает обоснование направлений повышения эффективности аграрного производства, включая технологическую модернизацию, цифровизацию и развитие человеческого капитала.