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ISSUES IN ASSESSING THE PROFITABILITY LEVEL OF AGRICULTURAL PRODUCTION

Abstract

The profitability of agricultural production demonstrates how effectively land, labor, and financial resources are used to produce the final product. However, traditional methods of analyzing and forecasting economic efficiency often fail to account for the complexity and diversity of modern agricultural processes. Agriculture is characterized by a high level of uncertainty and dependence on many factors, such as weather conditions, market fluctuations, and technological changes. Therefore, there is a need to improve the methodology for assessing, analyzing, and forecasting the profitability of agricultural products. The purpose of this article is to study current issues in assessing and forecasting agricultural production efficiency based on the indicator of product profitability. In accordance with this goal, the following research objectives are addressed using abstract logical and comparative methods: generalizing theoretical approaches to interpreting the concept of “production efficiency” and the content of its indicators; and investigating forecasting methodology, particularly forecasting the efficiency of agricultural production. Based on the conducted factor analysis of profitability, a forecast of the production efficiency of certain types of agricultural products is substantiated, and the proposed measures are evaluated. The methodology for assessing the profitability of agricultural enterprises can be used as one of the criteria for providing them with state financial support.

Keywords: profitability, profitability assessment, agricultural products, analysis methods, forecasting economic efficiency, factor analysis of profitability, correlation analysis, regression equation solution.

Introduction

Issues related to improving the efficiency of grain production, strengthening the financial sustainability of agricultural enterprises specializing in grain cultivation, and enhancing the competitiveness of domestic products in the global market have always been at the center of attention of both the state and the scientific community. This is due to the fact that sustainable agricultural development and the improvement of its economic efficiency have been and remain key priorities. The successful development of all branches of agriculture largely depends on the level of grain production. Grain production determines the specialization of individual regions, ensures food security for the population, and provides high-quality feed for livestock.

Problems of comparative analysis of agricultural production efficiency are consistently examined in the works of domestic and foreign scholars. These studies provide a detailed theoretical and practical analysis of efficiency indicators, their interrelationships with other economic indicators, and the influence of various factors on their dynamics, the most significant of which is the cost of production.

The essence and significance of cost-based analysis of production costs lie in the evaluation of cost components as factors contributing to increased efficiency of agricultural production [1, 2]. It should be emphasized that one of the fundamental aspects of the significance of the cost indicator in assessing the performance of economic entities lies in its essential role in the calculation of efficiency indicators, among which production profitability occupies a central place.

However, the need for continuous analysis of changes in indicators calculated on the basis of economic and production factors should not be overlooked, since these indicators encompass all elements of the production process. Such an approach is necessary for forecasting the efficiency of agricultural production using additive models and methods for calculating the proportional impact of individual factors within analytical frameworks. In this regard, there is an evident need to develop new methodological approaches to assessing profitability and forecasting the efficiency of agricultural production. The proposed new approach is an assessment of profitability using such elements of analysis as the gross profit indicator, since its value in agricultural enterprises differs significantly from the value of net profit and indicators characterizing cost elements.

In economic analysis, the results of enterprise activity can be assessed using indicators such as production volume, sales volume, and profit. However, these indicators alone are insufficient to form an objective judgment about the efficiency of a particular enterprise. This is because these indicators characterize entrepreneurial activity, while their correct interpretation in efficiency assessment is only possible in combination with other indicators reflecting the amount of resources invested in the enterprise. Therefore, profitability indicators are calculated in economic analysis to enhance overall enterprise efficiency, including profitability of various areas of activity (economic, financial, and entrepreneurial).

Thus, the purpose of this article is to develop scientific and practical approaches to assessing, analyzing, and forecasting the profitability of agricultural products, contributing to increased economic efficiency of agricultural enterprises and sustainable development of agriculture as a whole.

This article aims to develop scientific and practical approaches to assessing, analyzing, and forecasting the profitability of agricultural products using an additive model and a method for calculating the proportional impact of individual factors on profitability. This approach will facilitate a methodologically sound determination of the economic efficiency of agricultural production, which ultimately determines the sustainable development of agriculture.

Materials and methods

The scientific literature presents several interpretations of profitability. One definition describes profitability as an indicator of economic efficiency of production at enterprises, comprehensively reflecting the use of material, labor, and financial resources. The term originates from the German word “rentabel”, meaning profitable, cost-effective, or self-sustaining. It is also associated with the word “rent”, meaning income, emphasizing the financial nature of profitability and its connection to profit and economic benefit.

According to other researchers, profitability represents the ratio of profit to production costs, monetary investments in commercial operations, or the total value of assets employed in enterprise activities.

Economic literature often uses terms considered synonymous with profitability, such as return, profitability, and efficiency. Each of these emphasizes different aspects of a company’s financial performance. For example, return is often associated with cash flows, while profitability after deducting all expenses focuses on net profit. Efficiency generally reflects the enterprise’s ability to use its resources optimally to achieve maximum profit. Despite differences in emphasis, these concepts collectively provide a comprehensive picture of the financial condition and production performance of an enterprise.

Some scholars consider the performance of enterprises from the perspective of their production, financial, and structural characteristics. For example, A. Salah, D. Çağlar, and K. Zoubi examine the impact of production and operations management practices on improving the performance of enterprises [3]. The authors Agnus Baby, Md Aslam Mia, and Anwar Allah Pitchay provide a systematic review of studies devoted to the financial performance of enterprises in their work, summarize the key

indicators of financial performance, the factors that form it, and modern methodological approaches to assessing financial performance in the manufacturing sector [4]. The article by P. Pérez-Gómez, M. Arbelo-Pérez, and A. Arbelo analyzes profit efficiency and the factors that determine it, and also examines the impact of managerial, financial, and structural characteristics of enterprises on their level of profitability and economic efficiency [5].

In the modern economic dictionary edited by B.A. Raizberg, profitability is defined as an indicator of final economic results over a certain period [6]. It is calculated as the ratio of profit obtained to the resources used, including fixed and working capital. This interpretation highlights profitability as a key criterion for evaluating enterprise efficiency, reflecting not only profit generation but also the effectiveness of resource utilization. The main components influencing this indicator include fixed assets (buildings, equipment, machinery) and working capital (raw materials, inventories, and financial resources).

Based on this definition, profitability reflects income generated through the use of resources in the production process and is closely linked to the concept of enterprise efficiency.

A.D. Sheremet considers profitability as a key indicator reflecting the efficiency of an enterprise's economic activity [7]. This efficiency is expressed through relative indicators of financial results achieved during the reporting period. According to Sheremet, profitability is an essential tool for assessing resource utilization and supporting managerial decision-making.

G.V. Savitskaya defines profitability as a relative indicator determining business profitability [8]. In her view, profitability indicators allow for the assessment of profit generation across different activities and provide a comprehensive overview of economic performance. These indicators reflect the relationship between resource utilization and economic outcomes and serve as an important tool for analysis and planning.

N.N. Bykova interprets profitability as an indicator of economic efficiency of production that comprehensively reflects the use of material, labor, and financial resources. According to the author, profitability demonstrates an enterprise's ability to utilize available resources most effectively to achieve maximum profit [9].

Based on the above, profitability can be defined as a relative indicator characterizing the level of enterprise profitability, overall efficiency of its operations, rationality of investments, and effectiveness of resource utilization.

Profitability is directly related to the amount of profit, but it cannot be equated with absolute profit figures. Unlike profit alone, profitability indicators more fully reflect final business performance, as they account for the relationship between efficiency and invested capital or utilized resources. It is no coincidence that financial performance is determined by both profit and profitability levels. High values of these indicators indicate greater efficiency and financial stability of the enterprise.

The issues addressed in this article related to the assessment, analysis, and forecasting of agricultural product profitability were examined using the abstract-logical method, as well as comparative analysis of calculated dynamic levels and structural changes in enterprise performance indicators. The scientific and practical value of the study lies in substantiating methodologically sound approaches to evaluating business performance based on production volume, sales volume, and profit. The calculations are justified through analysis of dynamic and structural changes occurring in agricultural production and the formation of enterprise income and expenses.

Methodological foundations of efficiency forecasting, as a key element of strategic management and planning in modern economic conditions, include various approaches to defining profit, current costs, and advanced capital used in efficiency calculations. The application of different profit indicators enables a more in-depth and comprehensive analysis, taking into account specific research conditions and objectives [10].

To determine relationships between variables and construct a forecasting model, regression analysis was employed, allowing for consideration of multiple factors influencing the projected indicator. Based on regression analysis, a mathematical model was developed to simulate real processes, as modeling facilitates forecasting of complex systems while accounting for interdependencies between various parameters.

The methodology for determining profitability levels is based on two groups of indicators. First, indicators calculated using profit, net profit, sales volume, cost of production, equity capital, and other

types of capital. Second, indicators used to assess product profitability, as well as resource and cost efficiency. These calculations are also based on profit, net profit, total costs, fixed assets, working capital, labor costs, and other factors.

For example, the cost recovery ratio or profitability of production activity (R_x) is calculated as the ratio of profit from product sales before interest and taxes (EBITDA) to the cost of sold products (C_{sp}):

$$R_x = \text{EBITDA} / \text{Зпп.}$$

The essence of this methodological approach lies in demonstrating how much benefit an enterprise gains from each tenge spent on production and sales. A decline in this indicator indicates that production costs are growing at a faster rate, as production profitability clearly reflects the impact of increasing or decreasing costs.

The profitability of sales or product realization (R_s) is calculated as the ratio of gross profit (G_p) to sales revenue (R):

$$R_s = G_p / R$$

This indicator characterizes the efficiency of agricultural activity by showing how much profit an enterprise earns per tenge of sales. An increase in sales profitability may result from either rising product prices with unchanged costs or reduced production costs at constant prices. In both cases, enterprise profitability and efficiency improve.

Results and discussion

Grain occupies a dominant position in the foreign trade relations of the Republic of Kazakhstan. The grain sector is primarily dominated by wheat, which serves as the country's main export product. This underscores the strategic importance of grain farming for Kazakhstan's economy.

According to data from the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan [11], gross output of cereals and legumes in 2023 decreased by 22.4% compared to 2022 and amounted to 17.1 million tons. In fact, 2021 was the least successful year for grain production over the past decade, and therefore even the slight increase in 2023 compared to 2021 cannot be considered a satisfactory or successful result. In 2024, gross grain harvest reached 24.7 million tons, exceeding the previous year's level by 48.6%.

In the 2025 reporting year, the gross grain harvest reached almost 27 million tons, 9.3% more than the 2024 harvest. It should be noted that 2023 turned out to be the second-worst grain harvest in the last 12 years.

The decline was largely driven by reduced wheat output, with gross wheat harvest in 2023 estimated at 12.1 million tons, representing a 26.2% decrease compared to 2022.

It's important to emphasize that, in addition to unfavorable weather conditions, land degradation and the prevalence of monocrops in the crop structure also contribute to crop shortages. Furthermore, unbalanced agricultural market planning occurs, with farmers, for example, focusing on cabbage one year and switching to onion production the next. This leads to unstable prices and logistical overload.

Furthermore, the state, from its budget, allocates loans and subsidies to agricultural producers. Nevertheless, the share of investment in fixed capital remains low, and the overall efficiency of agricultural producers' use of subsidies and loans remains low, as the results they achieve are not always stable. Furthermore, issues of objectivity and transparency in the provision of financial resources remain unresolved, and they are often distributed unevenly, leading to the concentration of funds in large agricultural holdings, exacerbating inequality and reducing the competitiveness of smaller agricultural enterprises.

The chart illustrating the gross harvest of cereals and legumes in the Akmola region over the analyzed period demonstrates a rather unstable trend, as increases in production volumes alternate with periods of decline (Figure 1). Nevertheless, the average annual growth rate of the gross wheat harvest shows a positive trend and amounts to an average of 104.9% per year.

The dynamics of wheat yield presented in figure 2 also fluctuate from year to year. As shown in Figures 1 and 2, changes in the gross harvest volumes of cereals and legumes are directly related to changes in their yields. In particular, in the Akmola region, the dynamics of wheat yield fluctuate at nearly the same rate as the gross harvest of this crop.

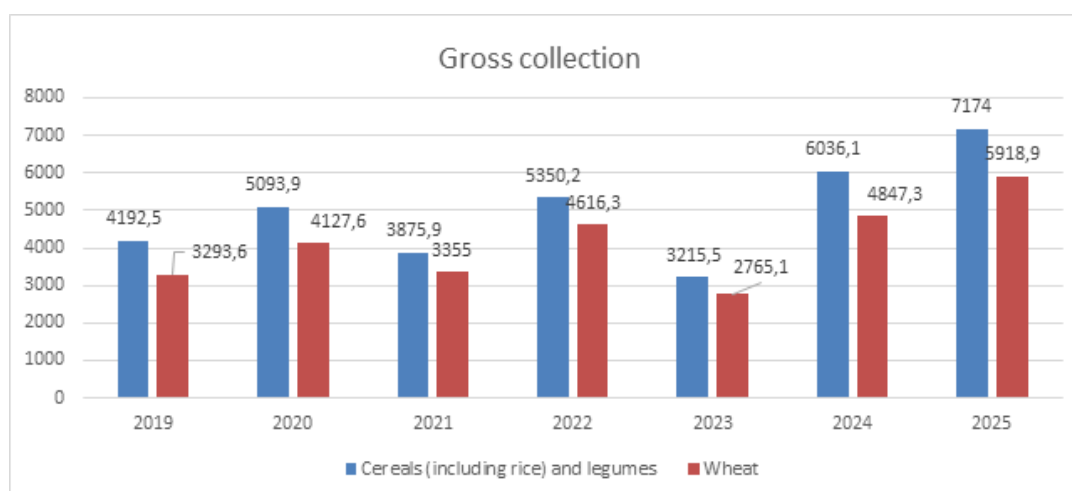


Figure 1 – Gross Harvest of Grain Crops in Akmola Region for 2019–2025

Note: Compiled by the authors based on source [11].

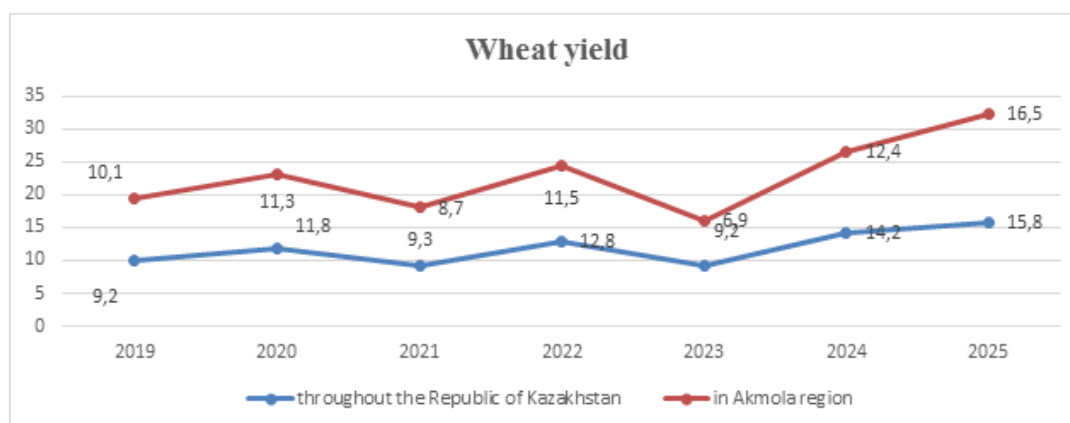


Figure 2 – Yield of Grain Crops in the Republic of Kazakhstan and Akmola Region for 2019–2025

Note: Compiled by the authors based on source [11].

The average annual rate of change in wheat yield is 102.6%, which indicates that the primary factor contributing to shortfalls in harvest volumes is the low yield of cultivated wheat.

Before proceeding to the assessment of the profitability level of agricultural production, it is necessary to analyze the results of the production activities of En-Dala LLP, as this will allow for a more objective evaluation of resource utilization efficiency and identification of the key factors influencing the enterprise's performance indicators. Moreover, the analysis of production indicators of an agricultural enterprise represents a core element of management and strategic planning in the agro-industrial complex.

A systematic and detailed analysis of production indicators is also an integral part of the management process, since in today's competitive economic environment agricultural enterprises face numerous challenges, including changing market conditions, climate variability, and fluctuations in prices for agricultural products and production resources [12].

The main objective of such an analysis is to assess the current situation and to identify reserves for increasing productivity and profitability of agricultural production. At the same time, we proceed from the premise that the core of any economic entity's operations is invariably production or another form of income-generating activity that yields a certain level of revenue from sales, which ultimately determines the performance, that is, the efficiency of such activity.

Table 1 – Dynamics of Production Indicators of En-Dala LLP

Indicators	2022 year	2023 year	2024 year	Change, %	
				2023 y	2024 y
Revenue from sales, thousand KZT	2 824 769	1 641 535	3 277 394	58,1	199,6
Average annual value of fixed assets, thousand KZT	3 787 340	3 828 632	5 758 270	101,1	150,4
Average number of employees, persons	125	125	125	-	-
Labor productivity, thousand KZT	22 598	13 132	26 219	58,1	199,6
Capital–labor ratio, thousand KZT	30 299	30 629	46 066	101,1	150,4
Wheat yield, centners/ha	9,2	5,0	12,4	54,3	в 2,5 p
Wheat sown area, ha	9 289	10 000	6 090	107,6	60,9
Gross wheat harvest, tons	10 335	5 000	7 552	48,4	151,0
Note: Compiled by the authors based on enterprise data of En-Dala LLP (reporting for 2025 has not yet been compiled).					

To improve the efficiency of enterprise operations, the growth rate of labor productivity should exceed the growth rate of capital–labor ratio (table 1). This implies that investments in fixed capital must be accompanied by an even greater increase in labor productivity, which ensures optimal use of investments and contributes to an overall increase in enterprise profitability.

According to the data in table 1, En-Dala LLP demonstrates an overall positive trend in capital–labor ratio, with a sharp increase in 2024 compared to 2023 by 50.4%, driven by growth in the average annual value of fixed assets. Labor productivity, however, showed instability over the analyzed period. In 2023, labor productivity declined by nearly 42%, amounting to just over 13 million KZT, primarily due to a reduction in sales revenue. In contrast, in 2024 labor productivity nearly doubled compared to 2023, reaching more than 26 million KZT in absolute terms.

It should be noted that in 2024 the growth rate of labor productivity significantly exceeded the growth rate of capital–labor ratio, whereas this condition was not met in 2023. When the growth rate of capital–labor ratio exceeds the growth rate of labor productivity, enterprises may face a decline in economic efficiency. In such cases, additional investments in fixed assets do not pay off through increased output or reduced costs.

A decline in efficiency is also evidenced by the reduction in the gross harvest of the monocrop cultivated by En-Dala LLP, namely wheat, in 2023, despite an expansion of the sown area (table 1). This indicates that enterprise investments aimed at increasing crop yields did not yield the expected return, as the key factor–yield–declined by nearly two times compared to the previous year.

Table 2 – Dynamics of Absolute Indicators of Wheat Sales at En-Dala LLP

Indicators	2022 year	2023 year	2024 year	Change, %	
				2023y	2024y
Wheat sales volume, tons	10 843	7 227	7 072	66,6	97,8
Cost per ton, KZT	96 971	162 538	99 688	167,6	102,6
Selling price per ton, KZT	117 160	80 939	80 032	69,1	98,9
Total production cost, thousand KZT	1 051 456	1 174 618	704 990	111,7	100,4
Sales revenue, thousand KZT	1 270 325	584 927	565 984	46,0	96,8
Financial result, thousand KZT	218 869	- 589 691	- 466 296	–	–
Note: Compiled by the authors based on the financial statements of En-Dala LLP (reporting for 2025 has not yet been compiled).					

The data in table 2 show that wheat sales generated profit only in 2022. Profitability in that year was driven by higher production and sales volumes, increased yields, expanded sown areas, and higher selling prices. In contrast, 2023 saw a decline in yields, leading to a significant reduction in gross

output and sales volumes, combined with a sharp increase in production costs (table 1). As a result, wheat production in 2023 was unprofitable, with losses amounting to 596.8 million KZT.

Wheat selling prices fluctuated over the analyzed period. For example, in 2022 the selling price reached 117,160 KZT per ton, whereas in 2023 it declined by 30.9%.

Overall, 2024 was a relatively profitable year for the enterprise. However, wheat production and sales remained unprofitable due to increased production costs and lower selling prices, resulting in losses of 466.3 million KZT. In 2024, only 7,072 tons of wheat were sold for approximately 566 million KZT. Notably, wheat yield increased by 2.5 times compared to 2023, while the sown area under this crop was reduced by nearly 4,000 hectares.

This strategy reflects En-Dala LLP's shift toward expanding areas under technical and oilseed crops to increase sales and profitability. For example, flax production at the enterprise amounted to 2,246 tons in 2021 and 1,060 tons in 2022. Flax sales reached 1,805 tons in 2022 and 782 tons in 2023, generating more than 500 million KZT in revenue.

Farmers increasingly choose flax for several reasons. This crop has high adaptability and requires relatively low cultivation costs. The same machinery used for grain crops can be employed for sowing and harvesting flax. Average flax prices exceed those of cereals, making its production more profitable. Additionally, flax has a shorter growing cycle and enjoys stable market demand due to its widespread use in the food, textile, and pharmaceutical industries. These factors make flax an attractive crop for farmers seeking to improve profitability.

Since our republic is located in a risky agricultural zone, productive years typically alternate with lean ones. Therefore, it's important for us to maximize risk diversification, meaning we can plant a variety of crops so that if prices for one crop fall, another can maintain overall profitability.

The existing methodology for analyzing and assessing profitability is based on net profit rather than gross profit [13, 14]. When profitability is calculated using net profit, significant differences arise due to the substantial gap between gross and net profit in agricultural enterprises. This difference is attributable to sales, financing, administrative, and other operating expenses.

Analysis of profitability by individual agricultural products is an important tool for assessing production efficiency and supporting informed managerial decisions. Such analysis helps identify the most profitable products, uncover internal cost-reduction reserves, and explore opportunities for improving product quality [15].

One indicator reflecting market demand and management efficiency is the sales profitability ratio (R_q), defined as the ratio of gross profit (P) to sales revenue (Q):

$$R_q = P / Q$$

Using the financial data of En-Dala LLP, sales profitability was calculated for 2022 (R_{q0}) and 2023 (R_{q1}):

$$R_{q0} = 342,132 / 1,612,839 = 0.212 \text{ or } 21.2\%$$

$$R_{q1} = -596,811 / 602,008 = -0.991 \text{ or } -99.1\%$$

Thus, sales profitability in 2023 declined by 120.3 percentage points compared to 2022, indicating the need for an in-depth analysis of the causes of this decline.

To assess the impact of changes in selling price and production cost on sales profitability, the following calculations were performed:

a) Effect of selling price changes:

$$\pm \Delta R_{\Delta p} = [(Q_1 - Z_0) / Q_1] - [(Q_0 - Z_0) / Q_0] = [(602008 - 1270707) / 602008] - [(1612839 - 1270707) / 1612839] = -1,111 - 0,212 = -1,323 = -132,3\%;$$

b) Effect of cost changes:

$$\pm \Delta R_{\Delta z} = [(Q_1 - Z_1) / Q_1] - [(Q_1 - Z_0) / Q_1] = [(602008 - 1198819) / 602008] - [(602008 - 1270707) / 602008] = -0,991 - (-1,111) = 0,119 = 11,9\%$$

The sum of these effects equals the total change in sales profitability:

$$-132,3\% + 11,9\% = -120,3\% - 132,3\% + 11,9\% = -120,3\% - 132,3\% + 11,9\% = -120,3\%$$

Based on the results of the analysis, it can be concluded that 2023 was the most unfavorable year for the agricultural enterprise under study, as operations were loss-making and the efficiency of invested capital utilization was low. Compared with previous years, grain yields declined significantly, which led to a reduction in gross output and sales volumes amid a simultaneous increase in production costs. As a result, revenue from grain sales decreased by more than 2.5 times. The year 2023 proved particularly challenging for domestic farmers due to adverse natural and climatic conditions.

Next, the identification and assessment of factors affecting the level of wheat profitability are examined using a statistical method – correlation–regression analysis, which is employed to study relationships between two or more variables. In the proposed model, the system of indicators includes a dependent variable (Y) representing the level of wheat production profitability, and the following explanatory variables:

- x_1 – selling price per centner of wheat;
- x_2 – cost per centner of wheat;
- x_3 – yield (centners/ha);
- x_4 – sown area (ha);
- x_5 – sales volume (centners);
- x_6 – production costs for seeds per hectare;
- x_7 – production costs for fertilizers per hectare;
- x_8 – production costs for chemical inputs per hectare;
- x_9 – production labor costs per hectare.

Table 3 – Initial Data for Correlation–Regression Analysis of Wheat Production Profitability

Period	Result variable	Factor variable								
	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
2020	58,89	7 159	45 056	12,7	8 253	101 130	3 545	4 601	11 116	10 868
2021	94,03	8 131	41 903	24	9 417	178 710	5 203	4 230	25 543	16 056
2022	20,82	11 716	10 324	9,2	9 289	108 430	7 189	7 749	19 421	13 259
2023	-5,11	9 796	9 697	8,1	9 063	103 320	4 481	6 378	15 624	17 042
2024	-50,20	8 094	16 254	5	10 000	72 270	8 809	4 360	12 437	14 184

Note: Compiled by the authors based on data from En-Dala LLP.

To construct the matrix of pairwise correlation coefficients, the Data Analysis add-in of Microsoft Excel was used. The calculation results are presented in table 4.

As shown in table 4, profitability exhibits a strong positive (direct) correlation with yield (0.916), a moderate correlation with production cost (0.773) and sales volume (0.851), and a noticeable negative (inverse) correlation with production costs for seeds. Since the analysis is based on statistical data from the agricultural sector, the identified relationships can be considered well-grounded.

At the same time, the selling price (–0.223), sown area (–0.518), and certain production cost indicators demonstrate moderate or weak relationships with profitability, which allows these factors to be excluded from further analysis.

Table 4 – Matrix of Pairwise Regression (Correlation) Coefficients

	Y	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9
Y	1									
x_1	-0,22296	1								
x_2	0,77280	-0,77291	1							
x_3	0,91657	-0,30407	0,73745	1						
x_4	-0,51830	0,21068	-0,4901	-0,18051	1					
x_5	0,85093	-0,0651	0,52383	0,96082	-0,06148	1				
x_6	-0,65054	0,30437	-0,56227	-0,45485	0,87226	-0,38217	1			
x_7	-0,13915	-0,4777	0,10053	-0,03171	-0,15786	0,05622	-0,46607	1		
x_8	0,51043	0,13598	0,12683	0,72619	0,22466	0,86856	-0,21385	0,1792	1	
x_9	0,06168	0,6597	-0,38423	0,22235	0,6384	0,41406	0,55839	-0,61944	0,52053	1

Note: Compiled by the authors based on the data in Table 3 using Microsoft Excel.

It should also be noted that there is a high correlation among yield (0.916), production cost (0.773), and sales volume (0.851), which may indicate the presence of multicollinearity. Multicollinearity among explanatory variables complicates or may even prevent reliable estimation of regression parameters and their meaningful interpretation. Since a high degree of correlation was found between yield and sales volume, and the relationship between profitability and yield proved to be stronger than that between profitability and sales volume, the variable x_5 (sales volume) was excluded from further analysis.

The results of the multicollinearity diagnostics (Variance Inflation Factors, VIF) for the independent variables are as follows:

x_2 : VIF = 2.56;

x_3 : VIF = 2.20;

x_6 : VIF = 1.47.

VIF values below 5 indicate the absence of significant multicollinearity among the independent variables. Therefore, multicollinearity does not represent a serious issue in the model. As a result, an improved correlation matrix was obtained, which is presented in table 5.

Table 5 – Improved Matrix of Pairwise Regression (Correlation) Coefficients

	Y	x_2	x_3	x_6
Y	1			
x_2	0,7728	1		
x_3	0,91657	0,73745	1	
x_6	-0,65054	-0,56227	-0,45485	1

Note: Compiled by the authors based on the data from Figure 2 using Microsoft Excel.

Using the Regression tool available in the Data Analysis add-in of Microsoft Excel, a regression analysis of wheat production profitability was conducted. Regression analysis allows for a more precise assessment of the impact of each factor on profitability and facilitates the development of recommendations aimed at improving the efficiency and profitability of wheat production.

The main characteristics of the regression analysis indicate that 91.1% of the variation in the dependent variable (Y) is explained by the model, demonstrating a high degree of fit to the observed data. The coefficient of determination shows that 91.1% of the variation in Y is driven by variations in x_2 , x_3 , and x_6 , while 8.9% is attributable to other factors not included in the present study. However, the p-values of all variables indicate that none of the coefficients are statistically significant at conventional significance levels (e.g., 0.05). This result is likely due to the small sample size (only five observations).

Based on the results of the correlation–regression analysis, the following regression equation was obtained:

$$Y = -6,5632 + 0,0002x_2 + 5,5904x_3 - 0,071x_6$$

Since Y represents wheat profitability, the regression coefficients can be interpreted as follows:

The positive coefficient 0.0002 (x_2 – wheat production cost) indicates that an increase in the cost of producing 1 centner of wheat by 1 tenge leads to an increase in profitability by 0.0002%, assuming other variables remain constant. This weak positive effect may suggest that higher costs are associated with improved product quality or more efficient production technologies.

An increase in wheat yield by 1 centner per hectare leads to an increase in profitability by approximately 5.6% (x_3 – wheat yield, coefficient 5.5904). This substantial positive effect highlights the critical importance of yield growth for improving profitability.

The negative coefficient -0.071 (x_6 – production costs for seeds) indicates that an increase in seed costs by 1 tenge per hectare reduces profitability by 0.071%. This weak negative effect may reflect inefficient use of seed inputs or the absence of a proportional yield increase resulting from additional expenditures on seeds.

It should be noted that the obtained results of the regression-correlation analysis are of an analytical nature and, in general, reflect preliminary and possible relationships between profitability and the selected production and financial factors using the example of the enterprise under consideration.

Conclusions

The profitability of agricultural products is a key indicator of enterprise economic efficiency. Traditionally, profitability is calculated based on net profit; however, this study argues that calculating profitability using gross profit provides a more transparent and operationally relevant approach to evaluating production efficiency.

Calculating agricultural product profitability based on gross profit offers several advantages, including an objective assessment of operational efficiency, simplified comparative analysis, improved transparency of cost management, computational efficiency, greater stability under seasonal conditions, a stronger focus on production processes, enhanced investment attractiveness, and reduced accounting distortions. These advantages make gross-profit-based profitability a preferable method for analyzing the performance of agricultural enterprises.

The results of the sales profitability analysis for the enterprise under study reveal a negative trend across all product types, with their shares in total sales varying from year to year. The decline in sales profitability in 2023 is primarily attributable to the deterioration of overall production and financial indicators.

A review of existing methodologies for assessing agricultural product profitability suggests that a key methodological requirement for efficiency analysis and forecasting lies in the proper justification of profit indicators, current costs, and advanced capital used in efficiency calculations.

More over, the proposed methodology for an adequate assessment of the profitability level of agricultural enterprises can be used as one of the criteria for the provision of state financial support, as it ensures the objectivity and comparability of results, takes into account the specific characteristics of agricultural production, and enhances the targeting and efficiency of budgetary resource allocation.

In addition, the methodology serves as an analytical tool for managerial decision-making, ensuring the comparability of results among economic entities and improving the governability of agricultural policy. The incorporation of profitability indicators into the system of criteria for granting financial support also performs a stimulating function by encouraging agricultural enterprises to improve resource-use efficiency, optimize costs, and adopt innovative technologies.

At the same time, the application of this methodology for determining and assessing profitability levels as a criterion for state support makes it possible to channel financial resources toward enterprises with stable or potentially efficient profitability, thereby reducing the risk of misallocation or inefficient use of budgetary funds and increasing the return on public investment.

The proposed methodology provides a comprehensive and objective assessment of profitability that accounts for sector-specific features of agricultural production, including seasonality, dependence on natural and climatic factors, and cost structure. This ensures a differentiated approach to the allocation of budgetary funds and enhances the targeting of state financial support.

Alongside traditional profitability indicators, the application of statistical methods, particularly correlation–regression analysis, enables more robust forecasting of production efficiency.

The conducted correlation–regression analysis and the calculated coefficient of determination demonstrate that 91.1% of the variation in the dependent variable (Y) is explained by variations in x_2 , x_3 , and x_6 , while 8.9% depends on other factors not included in the model. This implies that forecasting production profitability requires accurate estimation of yield, production costs, and input expenditures.

Finally, it is essential to emphasize the importance of accounting for the climatic characteristics of Kazakhstan, especially the steppe zone, which is characterized by high variability and instability of weather conditions. Addressing technological challenges under such conditions requires a high level of expertise, analytical capability, and creativity from agronomic services, underscoring the necessity for farmers to adhere to scientifically grounded technological recommendations.

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АУЫЛ ШАРУАШЫЛЫҚ ӨНІМ ӨНДІРУДІҢ РЕНТАБЕЛЬДІЛІК ДЕҢГЕЙІН БАҒАЛАУДЫҢ МӘСЕЛЕЛЕРІ

Андатпа

Ауыл шаруашылығы өнімінің рентабельділігі түпкілікті өнімді алу үшін жер, еңбек және қаржы ресурстарының қаншалықты тиімді пайдаланылғанын көрсетеді. Алайда экономикалық тиімділікті талдаудың және болжаудың дәстүрлі әдістері көбінесе қазіргі ауыл шаруашылығы процестерінің күрделілігі мен жан-жақтылығын ескермейді. Ауыл шаруашылығы белгісіздіктің жоғары деңгейімен және ауа райы жағдайлары, нарықтық ауытқулар және технологиялық өзгерістер сияқты көптеген факторларға тәуелділігімен сипатталады. Осыған байланысты ауыл шаруашылығы өнімдерінің рентабельділік деңгейін бағалау, талдау және болжау әдістемесін жетілдіру қажеттілігі туындады. Осы мақалада қойылған мақсат – ол ауыл шаруашылығы өндірісінің тиімділігін бағалаудың заманауи мәселелерін зерттеу және өнімнің рентабельділігі негізінде оны болжау. Мақсатқа сәйкес абстрактілі-логикалық және салыстырмалы әдістерді қолдану арқылы келесі зерттеу міндеттері қарастырылды: «өндіріс тиімділігі» түсінігі мен оның көрсеткіштерінің мазмұнын талқылаудың теориялық тәсілдерін жалпылау; болжау әдістемесін зерттеу, атап айтқанда, ауыл шаруашылығы өндірісінің тиімділігін болжау. Жүргізілген рентабельділіктің факторлық талдауы негізінде ауылшаруашылық өнімдері-

нің жекелеген түрлерінің өндірісінің тиімділігінің болжамы негізделіп, ұсынылып отырған шаралар бағаланды. Ауыл шаруашылығы кәсіпорындары қызметінің рентабельділік деңгейін барабар бағалау әдістемесі оларға мемлекеттік қаржылық қолдау көрсету өлшемдерінің бірі ретінде пайдаланылуы мүмкін.

Тірек сөздер: рентабельділік, рентабельдікті бағалау, ауыл шаруашылығы өнімдері, талдау әдістері, экономикалық тиімділікті болжау, рентабельдіктің факторлық талдауы, корреляциялық талдау, регрессиялық теңдеуді шешу.

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ВОПРОСЫ ОЦЕНКИ УРОВНЯ РЕНТАБЕЛЬНОСТИ ПРОИЗВОДСТВА СЕЛЬСКОХОЗЯЙСТВЕННОЙ ПРОДУКЦИИ

Аннотация

Рентабельность сельскохозяйственной продукции демонстрирует, насколько эффективно используются земельные, трудовые и финансовые ресурсы для получения конечной продукции. Однако традиционные методы анализа и прогнозирования экономической эффективности часто не учитывают сложность и многообразие современных сельскохозяйственных процессов. Сельское хозяйство характеризуется высоким уровнем неопределенности и зависимостью от многих факторов, таких как погодные условия, колебания рынка и технологические изменения. В связи с этим возникает необходимость в совершенствовании методологии оценки, анализа и прогнозирования уровня рентабельности сельскохозяйственной продукции. Цель данной статьи – изучение современных проблем оценки эффективности сельскохозяйственного производства и ее прогнозирования на основе показателя рентабельности продукции. В соответствии с этой целью с использованием абстрактно-логических и сравнительных методов рассматриваются следующие исследовательские задачи: обобщение теоретических подходов к интерпретации понятия «эффективность производства» и содержания его показателей; исследование методологии прогнозирования, в частности прогнозирования эффективности сельскохозяйственного производства. На основе проведенного факторного анализа рентабельности обоснован прогноз эффективности производства отдельных видов сельскохозяйственной продукции и проведена оценка предлагаемых мер. Методология оценки рентабельности сельскохозяйственных предприятий может быть использована в качестве одного из критериев предоставления им государственной финансовой поддержки.

Ключевые слова: рентабельность, оценка рентабельности, сельскохозяйственная продукция, методы анализа, прогнозирование экономической эффективности, факторный анализ рентабельности, корреляционный анализ, решение уравнения регрессии.

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