FORECASTING THE ECONOMIC POTENTIAL OF AGRICULTURAL PRODUCERS

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Abstract. *The article forecasts the parameters of agricultural development in Uzbekistan. In particular, a model of correlation and regression analysis has been developed to assess the impact of factors affecting gross agricultural output. Based on the results of the correlation and regression analysis, econometric models have been obtained, and long-term forecast parameters for 2024-2030 have been developed for the value of gross agricultural output and added value, as well as the share of agriculture in the country's GDP growth, factors affecting gross agriculture.*
Keywords: *agriculture, investments, research and development costs, state support measures, labor productivity, gross product value, forecasting.*

Introduction. In our country, a National Program has been adopted for the first time to adapt agriculture to climate change and mitigate its negative impacts. To ensure its implementation and support producers, more than 160 million US dollars have been attracted from foreign financial institutions. This year, 343 new projects aimed at developing the food industry in rural areas, as well as improving product storage and marketing infrastructure, were launched in 2024. In addition, 75 thousand hectares of land were allocated to more than 180 thousand socially vulnerable citizens and young people for the establishment of dehkan farms, and more than 200 thousand jobs were created. These measures play an important role in ensuring rural employment, increasing real incomes, and reducing poverty.

To increase household incomes from small-scale farming, 5,145 mahallas were specialized under the principle of “One Mahalla – One Product.” To improve livestock breeds and increase production volumes, 40 thousand head of cattle and 82 thousand sheep and goats were distributed to the population, and 260 thousand pedigree livestock were imported from abroad [1]. These results are the outcome of efforts aimed at attracting investments into agriculture, particularly foreign investments.

Therefore, investments in agriculture are recognized as having decisive importance [2]. Although analyses have been conducted on the necessity of investing in agriculture, there is still an insufficient number of scientific studies comparing the total volume and effectiveness of public and private investments made in this sector.

Literature review. G.V. Markova emphasizes the importance of attracting external investments for the development of investment activities in agricultural enterprises [3]. A.V. Masik considers technological modernization to be one of the key factors in the investment activity of agricultural enterprises [4]. Dolgopolova highlights the expansion of sources of investment resources for agricultural sectors, including attracting new investment resources through local and regional financial institutions, state financial support instruments (subsidies, concessional loans), and cooperative organizations [5].

Analysis and discussion of results. The analysis shows that the share of agriculture in the sectoral structure of GDP in Uzbekistan currently amounts to 24.12%, and this figure is expected to decrease to 22.0% by 2026. In the near future, the growth of gross value added in agriculture is forecasted to average around 4.0%, which in turn requires sufficient investment resources.

During the research process, a correlation and regression analysis model was developed to assess the impact of investments in agriculture, expenditures on scientific and technical developments, and subsidies allocated to the sector on gross agricultural output (Table 1).

Table 1. Correlation analysis of factors influencing the value of gross agricultural output

Variables:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
(1) Value of gross agricultural output, billion UZS	1.000				
(2) Investments in agriculture, billion UZS	0.961 (0.000)	1.000			
(3) Expenditures on research and technical developments in the agricultural science sector, billion UZS	0.969 (0.000)	0.940 (0.000)	1.000		
(3) Government support in agriculture, billion UZS	0.893 (0.000)	0.888 (0.000)	0.879 (0.000)	1.000	
(3) Labor productivity in agriculture, person/hour	0.810 (0.000)	0.796 (0.000)	0.757 (0.000)	0.825 (0.000)	1.000

The **pairwise correlation table** evaluates the linear relationships between variables using the Pearson correlation coefficient. Coefficient values range from –1 to +1, with p-values presented in parentheses (a correlation is considered statistically significant if $p < 0.05$).

Correlations with the value of gross agricultural output (Y): Investments (X1): Correlation coefficient 0.961 ($p < 0.001$), indicating a very strong positive linear relationship. This means that as investment volume increases, the value of agricultural output rises significantly. Research and development expenditures (X2): Coefficient 0.969 ($p < 0.001$), also showing a very strong positive correlation. Higher R&D spending strongly contributes to the increase in output value. State support (X3): Coefficient 0.893 ($p < 0.001$), indicating a strong positive correlation with output value. Labor productivity (X4): Coefficient 0.810 ($p < 0.001$), showing a positive correlation, though slightly weaker than the other variables.

Correlations among independent variables: Investments (X1) and R&D expenditures (X2): 0.940 ($p < 0.001$), Investments (X1) and state support (X3): 0.888 ($p < 0.001$), Investments (X1) and labor productivity (X4): 0.796 ($p < 0.001$), R&D expenditures (X2) and state support (X3): 0.879 ($p < 0.001$), R&D expenditures (X2) and labor productivity (X4): 0.757 ($p < 0.001$), State support (X3) and labor productivity (X4): 0.825 ($p < 0.001$)

The pairwise correlation analysis demonstrates a high level of positive linear relationships among the variables. All correlation coefficients are statistically significant ($p < 0.001$), confirming strong interconnections between these factors.

Table 2 presents the results of the regression analysis of the main production factors affecting the value of gross agricultural output (GAO).

Based on the regression analysis results, several key factors influencing the value of agricultural output have been identified. These include investments, research and development

expenditures, government support measures, and labor productivity. Each of these factors plays a different role in shaping the value of gross output.

Table 2. Regression analysis results of production factors affecting the value of gross agricultural output

Gross agricultural output value, billion UZS	Coefficient	Standard Error	t-value	p-value	[95% Confidence Interval]	Significance
Investments in agriculture, billion UZS;	2.803	1.693	1.66	0.064	[0.377, 11.541]	*
Expenditures on research and technical developments in agricultural science, billion UZS	8.822	544.623	0.74	0.002	[9.015, 62.66]	***
Government support in agriculture, billion UZS	6.601	2.319	5.43	0.000	[7.659, 17.543]	***
Labor productivity in agriculture, person/hour	0.055	0.485	0.11	0.735	[1.809, 2.502]	-
Constant	-2506.779	16328.037	-0.15	0.013	[-130784.15, -17977.896]	**
*** p<.01, ** p<.05, * p<.1						

According to the coefficient in the regression equation, an increase of 1 billion UZS in investments leads, on average, to a 2.803 billion UZS increase in gross agricultural output. This demonstrates the positive impact of investments on economic growth. The t-value = 1.66, p = 0.064, indicating that this factor is statistically significant at the 10% confidence level. This effect is achieved through improvements in infrastructure, technological updates, and expansion of production volumes.

The regression analysis results of the main production factors affecting the value of gross agricultural output (GAO) are presented. The regression equation takes the following form:

$$YAQXM = 2506{,}779 + 2{,}803 * x1 + 8{,}822 * x2 + 6{,}601 * x3 + 0{,}055 * x4 \quad (1)$$

The analysis shows that funds allocated for research and development have the strongest impact on gross agricultural output (GAO). Each additional 1 billion UZS invested in R&D leads, on average, to an 8.822 billion UZS increase in GAO. The t-value = 0.74, p = 0.002, indicating that this result is statistically significant at a level well below 1%, and thus highly reliable. These results demonstrate the crucial role of science-based approaches in improving the efficiency of agriculture.

Government subsidies, grants, and financial incentives also have a significant effect on GAO. The regression coefficient for this factor is 6.601, meaning that each 1 billion UZS of government support increases GAO by an average of 6.601 billion UZS. The t-value = 3.45, p = 0.000, showing that this factor is also highly significant at the 1% confidence level. This reflects the effectiveness of government policy and its role in the economy.

Table 3. Forecast indicators of gross agricultural output

Year	Value of gross agricultural output, billion UZS	Investments in agriculture, billion UZS	Expenditures on research and technical developments in agricultural science, billion UZS	Government support in agriculture, billion UZS	Labor productivity in agriculture, person/hour
2025	347701	18377	97	20143	35134
2026	379110	20118	103	22023	37668
2027	411778	21924	110	23979	40495
2028	445303	23777	117	25996	43632
2029	479346	25666	123	28050	47098
2030	513583	27577	130	30113	50909

Unexpectedly, labor productivity has no significant effect on the value of gross agricultural output (GAO). Its coefficient is 0.055 and is statistically insignificant: t-value = 0.11, p = 0.735 – a very high p-value, indicating that this factor is not statistically significant. This result may be related to the level of technological development and mechanization.

The intercept (constant) of the regression equation is –2506.779, which suggests that if all independent factors are zero, GAO could be negative. From an economic interpretation perspective, this reflects a negative trend in the absence of key production factors. Based on the results of the correlation-regression analysis, econometric models were used to forecast the value of gross agricultural output, value added, and the share of agriculture in GDP, taking into account the conditional factors X1, X2, X3, and X4 for 2024–2030. In developing forecast indicators and calculating their dynamics, the author's proposals for improving sectoral development and economic relations in agricultural production were also considered (Table 5.3).

Conclusion. Based on the forecast data, the institutional changes implemented in the agrarian sector and the increasing integration with leading countries in the field indicate that attracting investments to the sector, financing research and innovation, and increasing the scale of government subsidies and support, along with the introduction of new incentives, will contribute to sustainable development in 2024–2030.

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