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STATISTICAL ASSESSMENT OF AGRICULTURAL ENTREPRENEURSHIP EFFICIENCY IN KASHKADARYA REGION

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Abstract. This study provides a comprehensive statistical assessment of agricultural entrepreneurship efficiency in Kashkadarya Region, Uzbekistan. The research conceptualizes agricultural entrepreneurship as an integrated economic activity in which land, labour, capital, financial resources and technological capabilities are transformed into market-oriented agricultural output. The empirical framework employs dynamic-series analysis, growth-rate indicators, comparative analysis, labour-productivity measures and resource-efficiency ratios. Official statistical evidence demonstrates the substantial agrarian capacity of Kashkadarya and confirms the importance of evaluating production expansion jointly with productivity and resource utilization. The proposed indicator system establishes a methodological foundation for subsequent econometric modelling and forecasting of agricultural entrepreneurship efficiency.

Keywords: agricultural entrepreneurship; statistical assessment; efficiency; Kashkadarya Region; agricultural output; labour productivity; investment; dynamic series; resource efficiency; regional development

1. INTRODUCTION The transformation of agriculture into a competitive, technology-intensive and market-oriented sector has become an important prerequisite for sustainable regional economic development. Agricultural entrepreneurship connects productive resources with entrepreneurial initiative, market demand, investment decisions and technological innovation[1]. In regions where agriculture occupies a substantial position in the production structure, entrepreneurial efficiency influences employment, income formation, food security and the development of agricultural value chains.

Kashkadarya Region is one of Uzbekistan's strategically important agricultural territories. Its production structure combines crop production, livestock production, horticulture and other agricultural activities. The official statistical system provides annual and quarterly indicators covering agricultural production, employment and farm categories[2.3]. The SIAT database reports that employment in agriculture, forestry and fisheries in Kashkadarya amounted to 296.1 thousand persons in 2025, compared with 259.5 thousand in 2010. This long-term series demonstrates both the scale and structural dynamics of the regional agrarian labour market[4].

The relevance of the study derives from the necessity to distinguish production scale from economic efficiency. An increase in gross output does not automatically imply higher efficiency if labour, capital, energy, water or financial costs increase at a faster rate. Therefore, a rigorous statistical assessment should integrate output, productivity, investment intensity and resource utilization[5,6]. The objective of this research is to develop a scientifically grounded statistical

framework for assessing agricultural entrepreneurship efficiency in Kashkadarya Region and to identify empirical regularities that can subsequently be incorporated into econometric models.

2. MATERIALS AND METHODS The empirical information base consists of official statistical indicators published by the National Statistics Committee of the Republic of Uzbekistan and the regional statistical authorities. The study applies descriptive statistics, dynamic-series analysis, relative and structural indicators, growth-rate analysis and productivity ratios.

A generalized efficiency coefficient is expressed as E = Q/C, where E denotes production efficiency, Q represents agricultural output and C denotes production costs. Labour productivity is specified as LP = Q/L, where L is agricultural employment. Investment efficiency may be estimated through the ratio of incremental output to additional investment.

For dynamic analysis, the growth rate is calculated as $T=Yt/Yt-1\times100$. Average annual growth can be estimated using the geometric mean of annual growth coefficients. These measures enable the identification of acceleration, deceleration and structural changes in agricultural development.

For comparative territorial analysis, individual indicators may be normalized and aggregated into a composite Agricultural Entrepreneurship Efficiency Index. Such an index allows territories with different absolute scales to be compared on a common analytical basis.

3. RESULTS The statistical analysis demonstrates that Kashkadarya Region has a substantial agricultural production base and a significant labour potential. According to official statistical data, employment in agriculture, forestry and fisheries increased from 259.5 thousand persons in 2010 to 296.1 thousand persons in 2025, representing an absolute increase of 36.6 thousand persons, or 14.1% over the study period. The highest employment level in the observed series was recorded in 2017, at 342.3 thousand persons. Compared with 2010, this represents an increase of 82.8 thousand persons, or 31.9%. By 2025, however, employment had declined by 46.2 thousand persons, or 13.5%, relative to the 2017 peak. This non-linear trajectory indicates significant structural changes in the regional agricultural labour market and confirms the necessity of incorporating labour productivity rather than employment volume alone into efficiency assessment.

The calculations show that although the number of persons employed in the agricultural sector in 2025 was 14.1% higher than in 2010, it remained 13.5% below the 2017 maximum. Therefore, the observed increase in agricultural production cannot be attributed exclusively to the expansion of labour inputs. The role of capital intensity, mechanization, technological modernization and labour productivity should also be considered.

The production structure provides further evidence of the significant agricultural specialization of Kashkadarya Region. In 2025, agricultural producers in the region obtained 954.6 thousand tonnes of grain and leguminous crops, 286.3 thousand tonnes of melons, 215.2 thousand tonnes of fruits and berries, and 131.7 thousand tonnes of grapes. The combined volume of these four major product groups reached approximately 1,587.8 thousand tonnes.

The structure of the selected products is characterized by a pronounced dominance of grain and leguminous crops. Their share in the combined production of the four analysed product groups amounted to approximately 60.1%. Melon production accounted for 18.0%, fruits and berries for 13.6%, and grapes for 8.3%. This structure indicates that grain production remains the principal component of the selected agricultural output, while horticultural and melon production provide important opportunities for diversification and higher-value agricultural entrepreneurship.

The regional agricultural sector also demonstrates positive short-term dynamics. During January–June 2025, approximately 635.5 thousand tonnes of grain and leguminous crops were

produced in Kashkadarya. This confirms the considerable contribution of the region to the national agricultural production system.

Another important indicator is the overall volume of agricultural production. During January–September 2025, the volume of agricultural, forestry and fisheries output in Kashkadarya amounted to approximately 34,301.1 billion UZS, with a growth rate of 101.9% compared with the corresponding period of the previous year. Thus, the nominal volume of agricultural production increased by approximately 1.9% year-on-year.

The statistical results demonstrate that agricultural development in Kashkadarya is characterized by two simultaneous processes: relatively stable production growth and structural changes in labour utilization. The increase in production accompanied by a reduction in agricultural employment after 2017 may indicate a gradual shift toward more capital- and technology-intensive production. However, this conclusion requires verification through econometric estimation because the observed relationship may also be affected by changes in land use, prices, production structure and institutional factors.

To evaluate efficiency more comprehensively, the study proposes five groups of indicators: (1) production scale, (2) labour productivity, (3) capital and investment intensity, (4) land productivity, and (5) financial performance. The statistical evidence indicates that these dimensions should be analysed jointly. In particular, the 2025 employment level of 296.1 thousand persons combined with the substantial agricultural production volume demonstrates that labour input alone cannot adequately explain regional performance.

The obtained results provide an empirical basis for the subsequent econometric stage of the research. In particular, the variables of investment, employment, credit resources, fixed assets, land resources and technological provision should be tested as potential determinants of agricultural entrepreneurship efficiency. The next stage should estimate their marginal effects using a multivariate regression or panel-data model and determine which factors have statistically significant effects on regional agricultural efficiency.

Statistical conclusion. The empirical results show that between 2010 and 2025 agricultural employment in Kashkadarya increased by 14.1%, while the sector's employment peak occurred in 2017 at 342.3 thousand persons. In 2025, the region produced 954.6 thousand tonnes of grain and legumes, 286.3 thousand tonnes of melons, 215.2 thousand tonnes of fruits and berries, and 131.7 thousand tonnes of grapes. The combined output of these four product groups reached 1.5878 million tonnes. These quantitative results confirm the substantial agrarian specialization of Kashkadarya and provide an adequate statistical foundation for econometric modelling of agricultural entrepreneurship efficiency.

Table 1.

Dynamics of employment in agriculture, forestry and fisheries in Kashkadarya Region

Year	Employment, thousand persons	Change from 2010, %
2010	259.5	100.0
2015	336.1	129.5
2017	342.3	131.9
2020	307.6	118.5
2025	296.1	114.1

Source: compiled by the author based on official statistical data.

Table 2.
Production of selected agricultural products in Kashkadarya Region, 2025

Agricultural product	Production, thousand tonnes
Grain and leguminous crops	954.6
Melons	286.3
Fruits and berries	215.2
Grapes	131.7
Total	1,587.8

Source: compiled by the author based on official statistics.

Table 3.
Structural composition of selected agricultural production in Kashkadarya Region, 2025

Product	Production, thousand tonnes	Share, %
Grain and leguminous crops	954.6	60.1
Melons	286.3	18.0
Fruits and berries	215.2	13.6
Grapes	131.7	8.3
Total	1,587.8	100.0

Source: author's calculations based on official statistical data.

4. DISCUSSION The results suggest that agricultural entrepreneurship efficiency should be interpreted through the interaction of extensive and intensive development factors. Extensive expansion is associated with additional land and labour inputs, whereas intensive development is generated by technological upgrading, improved management, irrigation efficiency, mechanization and better capital allocation.

The statistical framework provides a direct transition to econometric modelling. Once the dependent efficiency indicator and explanatory variables are defined, multivariate regression can estimate the conditional contribution of investment, labour, credit, fixed assets, land and technological factors.

District-level panel data would further strengthen the analysis by controlling for unobserved heterogeneity. Such a database could distinguish persistent territorial characteristics from time-varying economic determinants and provide a stronger empirical foundation for regional policy.

5. CONCLUSION Agricultural entrepreneurship in Kashkadarya should be evaluated through an integrated statistical system rather than gross agricultural output alone. The analysis demonstrates the importance of combining production, employment, labour productivity, investment, land productivity and financial indicators.

The proposed framework provides a methodological foundation for identifying territorial disparities and selecting explanatory variables for econometric modelling. The results therefore constitute the empirical basis for the second article, devoted to the multivariate econometric estimation of agricultural entrepreneurship efficiency.

REFERENCES

1. Aigner, D., Lovell, C. A. K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. Journal of Econometrics, 6(1), 21–37.
2. Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. Empirical Economics, 20, 325–332.
3. Coelli, T. J., Rao, D. S. P., O'Donnell, C. J., & Battese, G. E. (2005). An Introduction to Efficiency and Productivity Analysis (2nd ed.). Springer.
4. Farrell, M. J. (1957). The measurement of productive efficiency. Journal of the Royal Statistical Society: Series A, 120(3), 253–290.
5. Kumbhakar, S. C., Wang, H.-J., & Horncastle, A. P. (2015). A Practitioner's Guide to Stochastic Frontier Analysis Using Stata. Cambridge University Press.
6. Mankiw, N. G. (2021). Principles of Economics (9th ed.). Cengage Learning.