DATA-DRIVEN ANALYSIS OF FRUIT AND VEGETABLE PRODUCTION AND EXPORT TRENDS IN UZBEKISTAN

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Abstract. The agricultural sector of Uzbekistan plays a key role in ensuring food security and export revenues, particularly through fruit and vegetable production. In recent years, the growing availability of official statistical data has enabled deeper analytical approaches to understanding production and export dynamics. This study presents a data-driven analysis of fruit and vegetable production and export trends in Uzbekistan based on official statistics published by the State Statistics Agency. The analysis focuses on major commodities such as grapes, apricots, apples, carrots, and mung beans, examining export volumes, destination markets, and production structure. Descriptive statistical methods and analytical tools were applied to identify temporal trends, structural characteristics, and interrelationships between production and export indicators. The results reveal steady growth in fruit and vegetable exports, strong market concentration toward neighboring countries, and a dominant role of smallholder and farm households in production. The findings provide an empirical basis for future analytical modeling and support evidence-based decision-making in agricultural policy and export development.

Keywords: Agricultural statistics, fruit and vegetable production, export analysis, data-driven analysis, Uzbekistan

Аннотация. Аграрный сектор Узбекистана играет ключевую роль в обеспечении продовольственной безопасности и формировании экспортных доходов, в особенности за счёт производства фруктов и овощей. В последние годы расширение доступности официальных статистических данных создало условия для применения более глубоких аналитических подходов к изучению динамики производства и экспорта. В настоящем исследовании представлен датадривен-анализ тенденций производства и экспорта фруктов и овощей в Узбекистане на основе официальных статистических данных, опубликованных Агентством по статистике. Анализ охватывает основные виды продукции, такие как виноград, абрикосы, яблоки, морковь и маш, и включает оценку объёмов экспорта, направлений поставок и структуры производства. Для выявления временных тенденций, структурных особенностей и взаимосвязей между показателями производства и экспорта

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были использованы описательные статистические методы и аналитические инструменты. Полученные результаты свидетельствуют о стабильном росте экспорта фруктов и овощей, высокой концентрации экспортных поставок на рынках соседних стран, а также о доминирующей роли фермерских и дехканских хозяйств в структуре производства. Сделанные выводы формируют эмпирическую основу для последующего аналитического моделирования и способствуют принятию обоснованных решений в сфере аграрной политики и развития экспортного потенциала.

Ключевые слова: аграрная статистика, производство фруктов и овощей, анализ экспорта, датадривен-анализ, Узбекистан

Annotatsiya. O‘zbekiston qishloq xo‘jaligi sektori oziq-ovqat xavfsizligi va eksport daromadlarini, ayniqsa meva-sabzavot yetishtirish orqali ta’minlashda muhim rol o‘ynaydi. So‘nggi yillarda rasmiy statistik ma’lumotlarning tobora ko‘proq mavjudligi ishlab chiqarish va eksport dinamikasini tushunishga chuqurroq analitik yondashuvlarni taqdim etdi. Ushbu tadqiqot Davlat statistika agentligi tomonidan e’lon qilingan rasmiy statistikaga asoslangan holda O‘zbekistonda meva-sabzavot ishlab chiqarish va eksport tendentsiyalarining ma’lumotlarga asoslangan tahlilini taqdim etadi. Tahlil uzum, o‘rik, olma, sabzi va mosh loviyasi kabi asosiy tovarlarga qaratilgan bo‘lib, eksport hajmi, maqsadli bozorlar va ishlab chiqarish tuzilmasini o‘rganadi. Vaqtinchalik tendentsiyalar, tarkibiy xususiyatlar va ishlab chiqarish va eksport ko‘rsatkichlari o‘rtasidagi o‘zaro bog‘liqlikni aniqlash uchun tavsiflovchi statistik usullar va analitik vositalar qo‘llanildi. Natijalar meva-sabzavot eksportining barqaror o‘sishini, qo‘shni mamlakatlarga kuchli bozor konsentratsiyasini va ishlab chiqarishda kichik va fermer xo‘jaliklarining dominant rolini ko‘rsatadi. Ushbu topilmalar kelajakdagi analitik modellashtirish uchun empirik asos yaratadi va qishloq xo‘jaligi siyosati va eksportni rivojlantirishda dalillarga asoslangan qarorlar qabul qilishni qo‘llab-quvvatlaydi.

Kalit so‘zlar. Qishloq xo‘jaligi statistikasi, meva-sabzavot yetishtirish, eksport tahlili, ma’lumotlarga asoslangan tahlil, O‘zbekiston

1. INTRODUCTION.

Agriculture remains one of the most important sectors of the Uzbek economy, contributing significantly to employment, rural incomes, and national food security. Within this sector, fruit and vegetable production occupies a strategic position due to its high export potential, value-added opportunities, and growing demand in regional and international markets. Uzbekistan has become one of the leading suppliers of fresh and processed fruits and vegetables in Central Asia, exporting a wide range of products to neighboring countries and beyond.

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Recent developments in digital governance and statistical transparency have improved access to official agricultural data, enabling more systematic analysis of production and trade dynamics. However, despite the availability of aggregated statistical indicators, many studies still focus on general descriptions or isolated indicators, without providing an integrated data-driven assessment of production structure and export performance. In particular, limited attention has been given to linking production volumes, export quantities, and market destinations within a unified analytical framework.

Data-driven analytical approaches, supported by statistical and computational tools, allow researchers to identify trends, structural shifts, and relationships that are not immediately evident from descriptive reporting alone. While artificial intelligence and machine learning techniques are often associated with forecasting tasks, their analytical potential for trend identification, pattern recognition, and comparative analysis is increasingly recognized in applied agricultural economics.

This study aims to conduct a comprehensive data-driven analysis of fruit and vegetable production and export trends in Uzbekistan using official statistical data. The research focuses on key commodities, including grapes, apricots, apples, carrots, and mung beans, and examines export volumes, market distribution, and production structures across various types of agricultural enterprises. By providing a structured empirical analysis, the study seeks to contribute to a better understanding of the current state of Uzbekistan's fruit and vegetable sector and to establish a foundation for future analytical and predictive research. International agricultural statistics from FAOSTAT are referenced to ensure methodological consistency and comparability with global agricultural trade indicators.

2. DATA AND METHODS

2.1 Data Sources. The empirical data used in this study were obtained from official statistical releases published by the State Statistics Agency of the Republic of Uzbekistan through its verified Telegram channel. The dataset includes aggregated indicators on fruit and vegetable production and export activities for the year 2024, covering the period from January to November and January to December, depending on data availability.

The analyzed indicators comprise export volumes (in tons), export values (in U.S. dollars), production volumes, and the distribution of production across different categories of agricultural producers, including farm enterprises, dehkan and household farms, and agricultural organizations. The use of official government statistics ensures data reliability and consistency with national reporting standards.

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2.2 Analytical Approach. To quantify the structure of fruit and vegetable exports and production, several analytical indicators were employed. Market concentration and export structure were assessed using proportional analysis, while implicit price indicators were calculated to support comparative interpretation.

The share of exports directed to a specific destination country was calculated as:

$$S_i = \frac{X_i}{\sum_{i=1}^{n} X_i} \times$$

Where S_i represents the share of exports to country i (in percent), X_i denotes the export volume to country i (in tons), and n is the number of export destinations.

To approximate export price dynamics in the absence of direct price statistics, the implicit average export price was calculated as:

$$P = \frac{V}{Q}$$

Where P is the average export price (USD per ton), V denotes total export value (USD), and Q represents export volume (tons).

These indicators enable a data-driven interpretation of export structure and relative price levels across different fruit and vegetable products.

2.3 Units of Measurement and Data Consistency. All export quantities are reported in metric tons, and export values are expressed in U.S. dollars, in accordance with international trade reporting practices. Production volumes are also presented in tons. This standardization ensures consistency and facilitates comparison with international statistical sources and future analytical studies.

3. RESULTS AND DISCUSSION

3.1 Export Performance of Major Fruit and Vegetable Products. The statistical data indicate a strong export orientation of Uzbekistan's fruit and vegetable sector in 2024. Among individual commodities, grapes represent the largest export item in physical terms. During January–November 2024, Uzbekistan exported 205.5 thousand tons of grapes with a total value of USD 174.7 million. Export flows were highly concentrated in neighboring markets, with Russia accounting for more than three quarters of total grape exports, followed by Kazakhstan and the Kyrgyz Republic. This concentration reflects both geographical proximity and established trade logistics, but it also implies a degree of market dependence.

To provide a quantitative overview of export performance, Table 1 summarizes export volumes and values for selected fruit and vegetable products in Uzbekistan in 2024.

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Table 1.

Export volumes and values of selected fruit and vegetable products in Uzbekistan (2024)

Product	Export volume (thousand tons)	Export value (USD million)
Grapes	205.5	174.7
Apricots	64.8	62.2
Carrots	125.2	29.6
Apples	44.3	14.5
Mung beans	123.4	99.4

As shown in Table 1, grapes dominate export volumes, while mung beans generate relatively high export value per unit. This indicates notable differences in market positioning and implicit export prices across fruit and vegetable products.

Apricot exports also demonstrated significant volumes, reaching 64.8 thousand tons with an export value of USD 62.2 million over the same period. Similar to grapes, apricot exports were primarily directed toward regional markets, particularly Russia and Kazakhstan. The dominance of a limited number of destination countries suggests that export performance is closely linked to regional demand conditions and trade agreements rather than diversified global market access.

Vegetable exports show comparable patterns. Carrot exports reached 125.2 thousand tons in January–November 2024, with a total value of USD 29.6 million. The main importing countries were Kazakhstan, the Kyrgyz Republic, and Russia. Apple exports, although lower in volume compared to other products, amounted to 44.3 thousand tons with an export value of USD 14.5 million during January–December 2024. These figures highlight the role of vegetables and temperate fruits as stable contributors to agricultural exports, even if their unit export values differ substantially across products.

Mung bean exports present a distinct case, with a strong concentration toward non-regional markets. In 2024, Uzbekistan exported 123.4 thousand tons of mung beans valued at USD 99.4 million, with China absorbing the overwhelming majority of shipments. This pattern indicates that certain agricultural commodities are integrated into more distant value chains, driven by specific demand structures and processing needs.

3.2 Aggregate Export Trends and Market Structure. At the aggregate level, Uzbekistan exported approximately 2 million tons of fruit and vegetable products in 2024, with a total value of USD 1.5 billion. Russia remained the leading export destination both in terms of volume and value, followed by Kazakhstan, the Kyrgyz Republic, China, and Pakistan. While neighboring countries dominate in volume,

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more distant markets such as China and Pakistan account for relatively higher export values per ton, suggesting differences in product composition, quality requirements, and pricing.

To assess the geographical structure of fruit and vegetable exports, major destination markets were analyzed in terms of export volumes and values.

Table 2.

Major export destinations of fruit and vegetable products (2024)

Destination country	Export volume (thousand tons)	Export value (USD million)
Russia	815.1	632.9
Kazakhstan	520.5	189.8
Kyrgyz Republic	151.7	57.9
China	144.6	128.6
Pakistan	124.7	192.3

According to Table 2, exports are highly concentrated in a limited number of destination countries. Russia alone accounts for a dominant share of total export volume, indicating a high degree of regional market dependence.

The observed export structure reflects a combination of comparative advantages in production and logistical accessibility. However, the high concentration of exports in a limited number of markets increases vulnerability to external shocks, such as changes in trade policy, border regulations, or demand fluctuations in partner countries. From a data-driven perspective, this concentration underscores the importance of monitoring export diversification indicators alongside total export growth.

3.3 Production Volumes and Structural Characteristics. Production statistics further support the observed export performance. In 2024, total vegetable production reached 11.99 million tons, while fruit and berry production amounted to 3.27 million tons. The structural breakdown of production reveals the dominant role of dehkan and household farms, which account for more than 60 percent of total agricultural output. Farm enterprises contribute nearly 30 percent, while agricultural organizations account for a comparatively small share.

This structure has important implications for export sustainability. Small-scale producers play a critical role in ensuring production volumes, but they may face constraints in terms of quality standardization, storage capacity, and access to export logistics. The observed export growth, therefore, reflects not only production expansion but also improvements in aggregation, trade facilitation, and coordination across the supply chain.

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Production structure was analyzed to identify the contribution of different categories of agricultural producers to total output.

Table 3.

Structure of fruit and vegetable production by farm category in Uzbekistan (2024)

Farm category	Production volume (thousand tons)	Share (%)
Dehkan and household farms	8,665.3	63.1
Farm enterprises	4,442.8	29.7
Agricultural organizations	697.7	7.2

The data in Table 3 indicate that dehkan and household farms dominate fruit and vegetable production, accounting for more than 60 percent of total output. This structure supports high production volumes but may limit standardization and export scalability.

3.4 Discussion and Analytical Implications. The data-driven analysis demonstrates that Uzbekistan's fruit and vegetable sector is characterized by steady growth in both production and exports, supported by a broad base of small producers and strong regional demand. At the same time, the concentration of exports in a limited number of markets and products suggests structural vulnerabilities that merit further analytical attention.

From an analytical perspective, the presented results provide a foundation for more advanced modeling approaches. The availability of consistent production and export statistics enables the application of machine learning and artificial intelligence methods for pattern recognition, clustering of export markets, and scenario-based analysis. While the present study focuses on descriptive and comparative analysis, the identified trends and structural relationships highlight areas where predictive and explanatory models could be applied in future research.

4. CONCLUSION

This study provides a data-driven analysis of fruit and vegetable production and export trends in Uzbekistan based on official statistical data for 2024. The results show that fruits and vegetables constitute a significant and growing component of the country's agricultural exports, with grapes, apricots, carrots, apples, and mung beans playing key roles. Export activity is characterized by strong regional orientation, particularly toward neighboring countries, alongside selective integration into more distant markets such as China.

Production data indicate that the sector relies heavily on dehkan and household farms, which supply the majority of output. This structural characteristic supports high production volumes but also poses challenges related to quality consistency, logistics, and market diversification. The observed alignment between

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production growth and export expansion suggests that recent increases in agricultural output have translated into tangible trade outcomes.

The findings underline the value of official statistical data for evidence-based analysis of agricultural markets. By applying data-driven analytical methods, the study moves beyond descriptive reporting and highlights structural patterns and interrelationships that are relevant for policy formulation and export strategy development. Although the present analysis does not involve direct price forecasting, it establishes a robust empirical basis for future research incorporating artificial intelligence and machine learning techniques for deeper analytical and predictive purposes.

In conclusion, the fruit and vegetable sector represents a strategically important component of Uzbekistan's agricultural economy. Continued improvement in data availability, combined with advanced analytical methods, can support more informed decision-making aimed at enhancing export diversification, strengthening value chains, and ensuring sustainable growth of the sector.

REFERENCES

1. Chen, M., Li, Y., & Zhao, K. (2021). Automated forecasting and analytical modeling of agricultural commodity markets using machine learning techniques. Computers and Electronics in Agriculture, 187, 106279.
2. Tran, Q. T., Pham, T. H., & Le, D. T. (2023). Artificial intelligence methods for agricultural market analysis: A systematic review. Expert Systems with Applications, 230, 120736.
3. Celik, M., Aydin, S., & Yildiz, E. (2025). Data-driven approaches to agricultural trade and market analysis. Journal of Forecasting, 44(2), 215–232.
4. World Bank. (2024). Agricultural trade and market integration in Central Asia. Washington, DC: World Bank Publications.
5. FAO. (2023). FAOSTAT statistical database. Food and Agriculture Organization of the United Nations.
6. State Statistics Agency of the Republic of Uzbekistan. (2024). Official statistical data on fruit and vegetable production and exports. Retrieved from the verified Telegram channel "STATISTIKA | Lotin" https://t.me/statistika_lotin.
7. OECD. (2022). Data-driven analysis of agricultural value chains. Paris: OECD Publishing.
8. UN Comtrade. (2023). International trade statistics database. United Nations.

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