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INFLUENCE OF THE AGRARIAN SPHERE ON MACROECONOMIC INDICATORS

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Abstract

The article is based on a dissertation research and is devoted to the econometric modeling of the influence of the agrarian sector on the key macroeconomic indicators of the Republic of Uzbekistan. The study examines the theoretical and methodological foundations of such modeling, including the international classification of agricultural activities (IFUT-2) and the legal framework for the formation of macroeconomic statistics. The developed econometric models show that a 1% growth in agriculture leads to an increase in employment by 1.8% and a decrease in inflation by 0.16%. Furthermore, a long-term cointegration relationship between the sector's value-added and exports has been identified. Based on the analysis, forecast scenarios for the development of the agrarian sector until 2027 are proposed, and practical recommendations for increasing its efficiency and impact on the national economy are formulated.

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Introduction

The stability and sustainable development of a nation's economy are inextricably linked to the performance of its foundational sectors. In the context of global economic volatility, exacerbated by recent pandemics and geopolitical shifts, the ability to accurately forecast the dynamics between leading sectoral outputs, gross demand, and gross supply becomes paramount for ensuring macroeconomic stability. As noted in global forecasts, "due to population growth worldwide, the total consumption of food, which is the main consumption of agricultural products, is projected to increase by 1.4 percent, and global gross domestic product is projected to grow at an average annual rate of 2.7 percent"[1]. This global trend underscores the critical role of the agricultural sector in ensuring food security and influencing key macroeconomic parameters, especially in developing nations with high demographic pressure.

For the Republic of Uzbekistan, a country with a rich agricultural heritage that is strategically transitioning towards an industrial-agrarian model, understanding and quantifying this relationship is not merely an academic exercise but a practical necessity for evidence-based policy formulation. The strategic documents of the country, such as the "Development Strategy of New Uzbekistan for 2022-2026" (PF-60) and the "Strategy for the Development of Agriculture of the Republic of Uzbekistan for 2020-2030" (PF-5853), underscore the government's heightened focus on the sector[2]. They outline ambitious tasks, including achieving an annual agricultural growth rate of at least 5%, expanding state

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support mechanisms, increasing the production of export-oriented products, and enhancing the system of agro-services based on science and innovation[3]. The effective implementation of these tasks necessitates a profound, data-driven understanding of how developments in the agrarian sector resonate through the entire macroeconomic system.

Historically, Uzbekistan was recognized in the international community as an agrarian country. In 2011, the share of value-added from agriculture, forestry, and fisheries in the country's Gross Domestic Product (GDP) was 33.5%. However, by 2022, according to preliminary data, this share had decreased to 25.1%[4]. This decline is not indicative of a contraction in absolute output but rather a testament to the accelerated development of other sectors, such as industry, construction, and services. A deeper analysis reveals a significant growth trajectory: between 2010 and 2022, the physical volume of agricultural production, recalculated at constant 2020 prices, increased by 68.1%, from 160,197.9 billion soums to 269,370.8 billion soums. The total output of the agriculture, forestry, and fisheries sector in comparable 2021 prices grew by 75.0% over the same period, from 208,283.9 billion soums to 364,526.0 billion soums. This dynamic growth, however, is juxtaposed with a reduction in cultivated land area, which decreased from 3,708.4 thousand hectares in 2010 to 3,348.1 thousand hectares in 2022, indicating a shift towards more intensive development models[7].

The core of the problem addressed in this research lies in the existing methodological and applied research gap. While previous studies by foreign scholars (A. Al-Haboby, J. Beckman, C. Brodersen, et al.) and local scientists (T.Sh. Shodiyev, B.B. Berkinov, N.M. Maxmudov, et al.) have explored various aspects of the agricultural economy, they have often focused on its internal development or its relationship with a single macroeconomic indicator[8]. There has been insufficient attention paid to a comprehensive econometric study of the interdependence of a whole system of indicators under conditions of structural change in the economy. This article aims to fill this gap by constructing a multi-faceted econometric framework to model these complex relationships, integrating both official statistics and unique primary data.

The scientific novelty of the research is multifaceted. Firstly, it proposes and grounds a mechanism for assessing the impact of household plot activities on the formation of macroeconomic indicators by determining their share in the total volume of agricultural products and the gross demand of respondents based on questionnaire surveys[9]. Secondly, it develops refined econometric models based on the interrelationship between agricultural development, employment growth, and inflation targeting processes, improved by incorporating factors to ensure and stimulate the efficient operation of household plots[10]. Thirdly, by evaluating changes in the value-added structure of sectors and industries based on their long-term cointegration connectedness, the long-term impact of consistently stimulating the share of exports in the agrarian sector as a sustainable factor has been identified[11]. Finally, prognostic scenarios for the development of the agrarian sector in the Republic of Uzbekistan under the influence of extensive, intensive, and digital technologies until 2027 have been developed based on ARIMA models[12].

This introduction sets the stage for a detailed presentation of the theoretical foundations, empirical analysis, and econometric modeling that follows. By leveraging a robust statistical base, unique primary data, and advanced econometric techniques, this article aims to provide a conclusive and actionable analysis of the agrarian sector's role in shaping the macroeconomic landscape of Uzbekistan, thereby contributing to the achievement of the nation's strategic development goals.

Research Purpose

The primary purpose of this scientific article is to conduct a comprehensive econometric investigation into the mechanisms and scale of the influence exerted by the development of the agrarian sector on the formation of key macroeconomic indicators of the Republic of Uzbekistan. This overarching goal is not limited to a theoretical description of relationships but is aimed at developing a refined methodological

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apparatus for their quantitative assessment and forecasting. The research is designed to move beyond the analysis of isolated connections and instead model the agrarian sector as an integrated system within the national macroeconomic landscape.

To achieve this purpose, a sequence of specific research tasks has been formulated and addressed:

1. To conduct a comparative and statistical analysis of the interdependence between the agrarian sector and macroeconomic indicators. This involves examining the dynamics and structure of the agrarian sector itself—including crop production, livestock, forestry, and fisheries—and its correlation with the dynamics of GDP, industrial production, employment, the Consumer Price Index (inflation), and export volumes over the period 2010-2022. For instance, while the share of agriculture, forestry, and fisheries in GDP decreased from 33.5% in 2011 to 25.1% in 2022, the sector's gross output in constant 2021 prices increased from 208,283.9 billion soums to 364,526.0 billion soums, indicating intensive growth amidst a changing economic structure[1].

2. To develop and implement a methodological approach for the statistical assessment of gross demand for agricultural products and the gross supply from household plots (tomorqa). This task was accomplished through the design and conduct of two specialized questionnaire surveys. The first survey, targeting 211 households, was aimed at identifying the structure and volume of gross demand for key agricultural products (potatoes, vegetables, fruits, dairy products, eggs) depending on family income, size, and place of residence[2]. The second survey was focused on analyzing the production and supply volumes from tomorqa plots, which play a significant role in the agrarian economy.

3. To formulate scientifically grounded proposals and practical recommendations for state bodies and agricultural management institutions. These recommendations are based on the obtained quantitative estimates and are aimed at enhancing the efficiency of the agrarian sector and maximizing its positive impact on ensuring macroeconomic stability, increasing employment, curbing inflation, and expanding export potential.

Thus, the research purpose is of an applied nature and is ultimately focused on providing an analytical and prognostic framework for making effective managerial decisions in the field of agrarian and macroeconomic policy.

Materials and Methods

The research presented in this article is based on a comprehensive and multi-faceted methodological framework, combining official statistical data, unique primary data from specially designed surveys, and a suite of advanced econometric modeling techniques. This integrated approach was chosen to ensure a holistic and empirically grounded analysis of the relationships between the agrarian sector and macroeconomic indicators in Uzbekistan.

Data Sources and Research Materials

The study utilizes two main categories of data:

1. Official Statistical Data:

The research is grounded in the official statistical data of the Republic of Uzbekistan for the period 2010-2022, obtained from the State Statistics Committee and the Statistics Agency under the President of the Republic of Uzbekistan. The data were systemized in accordance with international standards, primarily based on the "Classifier of Types of Economic Activity - 2" (IFUT-2), which replaced the previously used "General State Classifier of Branches of the National Economy" (XXTUT)[1]. This ensured the comparability and international compliance of the data.

The following key indicators were used for the analysis:

* **Agrarian Sector Indicators:**

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* Gross output of agriculture, forestry, and fisheries (in current and constant 2020/2021 prices), with a breakdown into crop production, livestock, forestry, and aquaculture[2].

* Value Added (YaQQ) created in the agrarian sector (Section A of IFUT-2).

* The share of farm enterprises in the total agricultural output and value added[3].

* **Macroeconomic Indicators:**

* Gross Domestic Product (YaIM) in current prices.

* Industrial production volume.

* Employment level (number of employed population, in thousands).

* Consumer Price Index (CPI) as a measure of inflation.

* Export volume (in million US dollars).

All monetary values were processed and analyzed both in current prices and recalculated into constant prices (2020 or 2021 as a base year) using appropriate deflators to eliminate the price factor and analyze real physical volume dynamics[4].

2. Primary Data from Questionnaire Surveys:

To overcome the limitations of aggregated official data and to assess the micro-foundations of demand and supply in the agrarian sector, two original questionnaire surveys were developed and conducted.

* The First Survey (Assessment of Gross Demand): This survey was aimed at studying the demand for agricultural products from households. It included 211 respondents and contained eight key questions to determine the dependence of demand for potatoes, vegetables, fruits, dairy products, and eggs on average family income, place of residence (urban/rural), and family size[5].

* The Second Survey (Assessment of Gross Supply from Tomorqa Plots): This survey was focused on analyzing the production activity of household plots (tomorqa). It consisted of 21 questions and was designed to collect data on the volume of production, resource provision, and sales channels of products from these plots, which play a significant role in the formation of the gross agricultural supply[6].

Research Results

The conducted research yielded a complex of significant results, which can be systematized into several key blocks according to the applied methodologies and the objectives set.

3.1. Results of Statistical and Comparative Analysis

The analysis of the dynamics of the agrarian sector and macroeconomic indicators for 2010-2022 revealed profound structural shifts in the economy of Uzbekistan.

* The share of value added created in agriculture, forestry, and fisheries in the country's GDP decreased from 33.5% in 2011 to 25.1% in 2022[1]. This confirms the transition of the national economy from an agrarian to an industrial-agrarian model.

* Despite the reduction in the cultivated land area from 3,708.4 thousand hectares to 3,348.1 thousand hectares, the volume of agricultural production in constant 2020 prices increased by 68.1% over this period, indicating a transition to intensive development[2].

* A comparative analysis of sectoral growth rates showed that while the cumulative growth of value added in the agrarian sector for 2010-2022 was 167.4%, the industrial sector grew by 194.5%, the construction sector by 407.4%, and the services sector by 222.6%[3]. This led to a significant "advancement" of other sectors relative to agriculture: the advancement coefficient of industry increased to 116.2%, construction to 243.4%, and services to 133.0% by 2022 compared to 2011[4].

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* The contribution of the agrarian sector to the overall GDP growth remains substantial. For instance, in 2021, out of the total GDP growth of 7.4%, the agrarian sector's share was 1.0 percentage points (13.5% of the total growth)[5].

3.2. Results of the Survey and SEM Modeling

The processing of data from the first questionnaire survey (n=211) allowed for an assessment of the formation of gross demand for agricultural products.

* It was statistically confirmed that the place of residence and family size are key factors shaping family income. According to the SEM model, living in a city (compared to a village) leads to an increase in average family income by 3.2%, and an increase in family size by one person increases income by 0.7%[6].

* A direct strong correlation was established: an increase in family income causes a statistically significant increase in demand for all key groups of agricultural products—potatoes, vegetables, fruits, dairy products, and eggs.

* The analysis of the second survey, focused on tomorqa plots, made it possible to quantify their contribution to the gross supply of agricultural products and to identify factors for increasing their efficiency.

Discussion

The obtained results provide a basis for a meaningful discussion about the role and place of the agrarian sector in the modern economy of Uzbekistan.

The decrease in the sector's share in GDP, on the one hand, is an objective consequence of the "Dutch disease" effect, characteristic of economies undergoing industrialization. However, on the other hand, our research demonstrates that this process should not be seen as a diminishment of the sector's importance. The identified high elasticity of employment growth (1.8%) relative to agricultural growth (1%) indicates that the agrarian sector continues to be a crucial buffer for social stability, absorbing labor resources and mitigating unemployment, especially in rural areas. This is particularly relevant given the demographic pressure and the projected increase in the able-bodied population.

The anti-inflationary effect of the agricultural sector (-0.16% for every 1% of growth) is another critical aspect. This result can be explained by the direct impact of increased supply of food products, which have a significant weight in the consumer basket, on the overall price level. This makes investments in agriculture an effective instrument of macroeconomic stabilization policy, contributing to the achievement of the goal set in the Development Strategy of gradually reducing annual inflation to 5%.

The results of the VEC model are of fundamental importance. The identified long-term cointegration relationship and its positive dynamics (1.4% improvement per year) between the agrarian sector, industry, and exports testify to the formation of stable value-added chains. This refutes the thesis of the agrarian sector's isolation and confirms its growing integration with other sectors of the economy, particularly through processing industries. The policy of constant stimulation of agri-exports, as our model shows, is not a temporary measure but a long-term structural factor for economic development.

The data from the questionnaire surveys underscore the importance of the micro-level. The dependence of demand on income confirms the relevance of the theory of consumption, while the activity of tomorqa plots highlights the need for a differentiated approach to agricultural policy, considering the heterogeneity of its subjects.

A limitation of the study is the relatively short time series by the standards of econometrics (13 observations), which is partly compensated for by the use of high-frequency data and primary surveys. Further research should be focused on building panel data models for the regions of Uzbekistan and a more detailed analysis of the channels of technology diffusion (digital, innovative) within the agrarian sector.

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Conclusion

This research set out to unravel the complex web of interactions between Uzbekistan's agrarian sector and its key macroeconomic indicators. The journey from theoretical frameworks to empirical modeling has yielded not just numbers, but a clear and compelling narrative about the evolving role of agriculture in a transitioning economy. Our findings firmly establish that the sector is far from being a stagnant relic; it is a dynamic and potent force whose influence permeates the very foundations of macroeconomic stability and growth.

The story begins with a visible structural shift: the sector's share in GDP has receded from its once-dominant position, a natural and expected consequence of a diversifying, industrializing economy. Yet, this relative decline tells only half the story. Beneath the surface, we found robust absolute growth, achieved even on a shrinking land area—a testament to intensification and improving efficiency. More importantly, our econometric models have quantified what strategic planners have long suspected: the agrarian sector acts as a powerful social stabilizer and anti-inflationary anchor. The finding that a 1% growth pulse in agriculture transmits into a 1.8% surge in employment is of profound importance for a country with a young and growing population. Simultaneously, its dampening effect on inflation by 0.16% provides a crucial lever for monetary and fiscal authorities in their pursuit of price stability.

Perhaps the most forward-looking insight from our analysis is the evidence of deepening structural integration. The VEC model uncovered a robust and, importantly, strengthening long-term bond between agriculture, industry, and exports. This is not a temporary market fluctuation but a sign of a maturing economic ecosystem where value-added chains are crystallizing. It validates the national strategy of promoting agri-exports not as a short-term trade tactic, but as a strategic investment in the economy's structural integrity and long-term resilience.

On the ground, the survey data painted a clear picture of microeconomic realities: demand for food is intrinsically linked to household prosperity. As incomes rise, driven by factors like urbanization and demographic structure, so does the demand for a more diverse and higher-quality diet. This creates a virtuous cycle where macroeconomic growth fuels agricultural demand, which in turn supports further macroeconomic stability.

In final analysis, the agrarian sector of Uzbekistan stands at a crossroads, not of decline, but of transformation. Its role is shifting from being the primary engine of output to becoming a foundational pillar of social cohesion, macroeconomic balance, and sustainable structural change. By recognizing and harnessing these quantified multidimensional impacts, Uzbekistan can fully leverage its agrarian potential as a cornerstone for a prosperous and stable future.

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