Assessment of the economic-structural changes of the agriculture of the republic of Uzbekistan

Gafurjon Zakhidov[1,*] and *Shahruzbek* Roziyev

[1]Kokand university, Kokand, Uzbekistan

Abstract. This article is devoted to the assessment of structural changes in the agriculture of the Republic of Uzbekistan. At first, the current issues of agriculture and the tasks of the Republic of Uzbekistan were mentioned in the article. After that, a brief review of the scientific literature on the topic, namely, the ideas about structural change, structural growth, and the concept of benchmark content is covered. Then, in the methodology of the research, the reference values for the agricultural composition, the proportionality of the reference composition (in the coefficient), and the formulas used to find the value of the improved Lilien index (MLI) are shown. In the results of the empirical analysis, the share of production of the main agricultural products in the structure of the economy (in percent), changes in the structure of production of the main agricultural products (in percent of the total), and reference values are expressed. At the end of the article, scientific conclusions and proposals are presented about the changes in the structure of production of the main agricultural products in the country, summarizing all the calculation results. Key words: agriculture, proportionality coefficient, Lilien index, structural change, national economy, economic growth, reference composition.

1 Introduction

In the economy of each country, special attention is paid to the development of sectors that affect the improvement of people's well-being and the effective use of all resources. The economic strengthening of the independence of the Republic of Uzbekistan is largely related to the effective development of agriculture.

Currently, the needs of the population of the republic for agricultural products are mainly reproduced by local production, that is, small businesses and private enterprises. Supplying the population of the country with high-quality flour, grain, bread and pasta products, confectionery products, oil products, meat and dairy products, and food concentrates is recognized as the most important task of the national economy.

Important economic and structural changes have taken place in the field of agriculture in the Republic of Uzbekistan in the last twenty years. These changes were driven by a combination of government policies, market conditions, and technological advances.

State policy: The government of Uzbekistan has implemented several policies aimed at the development of agriculture. In particular, the implementation of land reform, which

* Corresponding author: g.zaxidov@kokanduni.uz

allowed the privatization of state farms and the creation of private farms; the adoption of a new tax system that reduces taxes on agricultural production; and the establishment of price controls to ensure that farmers receive fair prices for their produce. In addition, to improve access to markets and reduce transportation costs, the government has invested heavily in infrastructure projects such as irrigation systems, roads, and warehouses.

Market forces: Trade policy liberalization has opened up Uzbekistan's agricultural sector to international markets. This allowed farmers to enter new markets and sell their products at higher prices. In addition, increased competition from foreign manufacturers is forcing domestic manufacturers to become more efficient to remain competitive.

Technological development: Technological development also played an important role in changing the agricultural sector of Uzbekistan. New technologies such as precision farming, GPS-guided tractors, and automated irrigation systems have allowed farmers to increase yields while reducing costs. In addition, improved access to information through mobile phones and the Internet has enabled farmers to make more informed decisions about production and marketing.

In general, these economic and structural changes have had a positive effect on the agricultural sector of Uzbekistan. Farmers can now produce higher yields at a lower cost and also tap into new markets for their produce. This has led to increased income for farmers and increased food security in the country as a whole.

Foreign scientists predict that the problem of food shortage may become the first pressing issue in the world shortly. According to the forecast of the United Nations, in addition to hunger, the constantly growing number of people leads to a decrease in the quantity and quality of food they consume. Two billion people, or 25.9 percent of the world's population, experienced hunger or lacked access to nutritious and sufficient food in 2019. If we do not act quickly and boldly, this situation could worsen and lead to further food insecurity in the future.

Today, the population's need for high-quality agricultural products is growing at a high rate and the composition is constantly being updated, the intense innovative processes taking place in the world economy and the intensification of interstate economic competition, agriculture that is compatible with the changing market conjuncture forming an efficient structure of production of products and thus carrying out an important structural policy in the network is one of the urgent economic tasks today.

For this reason, it is very important to evaluate the structure of production of this agricultural network, to study the laws of the formation of shares in this structure, and to form an optimal balance in the structure of agricultural production, to carry out an effective structural policy in the network. is the main condition.

Special attention is paid to issues such as implementing deep structural changes in the national economy, in particular, deepening structural changes in the high-tech industries of our country, as well as increasing its competitiveness due to the modernization and diversification of the leading industries of the national economy, in which high-tech processing. It is of particular economic importance to carry out tasks such as further modernization and diversification of the industry by transferring it to a qualitatively new stage aimed at the rapid development of the production of value-added finished products based on the deep processing of local raw materials.

Therefore, this article focuses on the assessment of structural changes in the agricultural sector and the research of important quantitative changes in it. In the article, the assessment of structural changes in agricultural production is carried out using methods such as the "proportionality coefficient" and "improved Lilien index".

2 Literature analysis

The analysis of scientific sources shows that the issues of quantitative assessment of agricultural structural changes and their economic aspects have not been sufficiently researched. However, structural changes in the structure of the national economy and its network, as well as the reasons for their origin, are more clearly explained about the issue.

It should be noted that statistical approaches to the concept of "structural change" are very common in many studies. Especially such approaches T. N. Agapova, A. Buz-Galina, K. Gatev, M. R. Efimova, V. K. Zadorojniy, L. S. Kazints, A. Kolganov, O. Yu. Krasilnikova, S. V. Kurysheva, V. M. Ryabtseva, A. Salay, M. M. Yuzbasheva and M. Lendesmen have a very wide place in the works, and the main reason for this is that the study of the changes of economic events in space and time is the main subject of the science of statistics.

Also, many local and foreign scientists and specialists conducted large-scale scientific research on issues of increasing the efficiency of agricultural production and statistical evaluation of its composition. In particular, X. D. Khudjakulov, N. X. Rashitova, N. N. Askerov, S. N. Seyfullaev, and H. Ergasheva, K. A. Choriyev emphasized the structural and economic mechanisms of agricultural activity in our country, the formation of the optimal structure of agricultural land, B. P. Pankov, agro-industrial complex models, N. A. Popova, issues of effective organization of the agricultural economy, and V. L. Somov expanded scientific research on the analysis of economic development of agriculture and determining the effectiveness of statistical methods to AML

In particular, according to L. S. Kazinets, the change of the shares representing individual elements of the collection over time means the change of content, i.e. structural shifts (Kazinets, 1969).

"M. Lendesman said that the concepts of structural change and structural growth are implemented in two ways. The first is a change in the composition of the economy, i.e. production, number of employed people, exports, imports, etc. The second is the changes in inter-structural relations, relations between production and labor force or direct investments, import-export dynamics, etc. Structural change represents the improvement and deterioration of the quality of economic systems. Structural changes in the economy are usually observed in technological and administrative changes. Technology, literacy, and institutional units, which are important factors of the economy, have a significant impact on the structural aspects of economic growth.

Kuznets: "Economic growth in the country can be evaluated by the ability of manufactured products to meet the growing needs of the population for a long time. These growth opportunities are based on the development of techniques and technologies, and the implementation of the necessary changes in the institutional structure and ideology.

Johnston and Mellor (1961) clearly describe agriculture as an active sector of the economy. Apart from providing labor and food, agriculture plays an active role in economic growth through the link between production and consumption. For example, agriculture may supply raw materials for non-agricultural production or require resources from the modern sector. On the consumption side, higher agricultural productivity can increase the incomes of rural residents and thus create demand for local industrial products. In addition, agricultural goods can be exported to earn foreign exchange for importing manufactured goods.

For example, in the scientific article "Statistical analysis of production processes in agriculture according to the forms of economic management" by Professor X. Xujakulov, statistical evaluation of the specific characteristics of agricultural products grown in our country, Scientific conclusions were given about its meaning and importance. level and dynamics of production by economic entities and economic categories in them.

In the scientific article "Economic and Statistical Analysis of Agricultural Production" by Associate Professor Jumaev, the current state of agricultural production in our country, the

role of industry in the economy of the country, the economic analysis of the main branches of economic activity, the main and the development of the industry should be carried out. problems in the following directions are highlighted

Structural change represents the quality improvement and structural development of economic systems. Structural changes in the economy are usually observed in technological and administrative changes. Technology, literacy, and institutional units, which are important factors in the economy, have a significant impact on the structural aspects of economic growth.

According to many experts, the existence of deep structural imbalances in the world economy was recognized as one of the main causes of the recent global crisis. However, a large number of studies show that "structural imbalance" was not only one of the main causes of the recent global crisis but also noted as one of the main causes of past global crises.

A. Although not exactly similar to this research of Lewis, in some sense close to the content of his research, scientific research can be found in the research of E. Engel. In particular, according to Engel's first law, "as the income of households increases, the expenditure on food (agricultural products) in their consumption structure decreases".

Although Engel's law expresses the structural changes in household consumption, its economic consequences serve to explain the reasons for the different structural changes in the national economy. Because, according to the scientist, as the income of households increases, the share of spending on expensive goods and services increases in their consumption structure. He explained that this will stimulate the growth of industries that create valuable goods and services.

Along with this, S. O. Xomidov in his scientific research used the proportionality coefficient and the improved Lilien index in the structural assessment of pharmaceutical industry production. The maximum share of the main pharmaceutical products and drugs in the manufacturing industry is 1.33 percent, and it is not enough. His further scientific research confirmed that there is a positive correlation between the growth rate of the country's processing volume and the growth rate of labor productivity in the processing industries and that the technological level of the processing industry is the main source of the growth of labor productivity in it.

Also, in his research, H. N. Sabirov confirmed that the dynamics of general changes in the production of basic food products, and the growth trend of the MLI index between 2015 and 2018 are stable. Taking into account that the food industry is the most high-tech sector of the economy, in 2018 it was 15.96 percent, which the author notes is not enough

As a logical continuation of the above scientific research, the issue of quantitative assessment of structural changes in the production of agriculture, which is considered the most high-tech branch of the economy, is considered below.

3 Methods

There are different approaches to describing and evaluating structural changes in scientific and economic literature. Of these, we use the "proportionality coefficient" proposed by P. Vatnik, taking into account the nature of the research, and it is found as follows.

$$Prop\ [X,Y] = \frac{(\sum_i X_i Y_i)^2}{(\sum_i x_i^2)(\sum_i Y_i^2)} \qquad (1)$$

P. Vatnik's "coefficient of proportionality" provides an opportunity to evaluate different contents or sets, and this coefficient is characterized by:

- for arbitrary $a, b > 0$, the equality $Prop\ [aX,\ bY] = Prop\ [X,Y]$ is valid;

- all possible values of the proportionality coefficient lie in the interval $0 \leq Prop\ [X,Y] \leq 1$

The correlation coefficient represents a numerical measure of the closeness between the contents of the benchmark and the contents being evaluated. If they are exactly the same, then $Prop\ [X,Y] = 1$. However, in the above study, insufficient theoretical explanations were given regarding the concepts of "benchmark content" or "benchmark" criteria.

Exactly, the above formula (1) is also found in Ye. Gorlova's studies, where the share of the $x_i - i$ industry in the GDP of the evaluated country, and $y_i -$, is recorded as the share of the same industry in the benchmark GDP. In this study, there are not enough explanations regarding the concepts of "benchmark" and "benchmark countries". However, in this research, the network structure of the national economy formed by "IHRT (Organization for Economic Cooperation and Development) countries" was taken as a reference structure.

According to the formula (1) mentioned above in Y.B. Oleynik's scientific research, the variables x_i and y_i are suitable indicators that represent the state of the content at different moments of time, and in this case, the proportionality coefficient has a structural character and determines the degree of mutual proportionality of the variables is emphasized.

According to S. Xomidov, "standard composition" is "effectively formed composition" and all evaluated compositions are compared with it, and based on the obtained empirical values of the proportionality coefficient, to what extent the evaluated compositions are proportional to "effectively formed composition" concluded that.

Taking into account the above research and opinions, the "benchmark composition" function is performed by the composition consisting of the average of the shares of individual annual agricultural production volumes in the total production volume of the main agricultural products during the research period (2010-2018).

Another important method for assessing structural changes is the Lilien index, which is defined as follows

$$LI_{s,t} = \sqrt{\sum_{i=1}^{n} x_{[it]} \cdot \left(ln\frac{x_{[it]}}{x_{[is]}}\right)^2}\ ,\ x_{[is]} > 0, \qquad x_{[it]} > 0 \qquad (2)$$

Here, $x_{[is]}$ and $x_{[it]}-i$ are the shares of i agricultural product or processing in the total volume of production of basic agricultural products in periods s and t, and the LI index is limited to "0" from below. If this index takes a value of "0", then it means that no structural changes have occurred in this production structure during the considered period.

This index also takes into account the size and dispersion of the shares in the composition

However, Dietrich in his research found $SCI_{[st]} = SCI_{[ts]}$ (SCI- structural change index) and $S_{[s,t]} \le S_{[s,q]} + S_{[q,t]}$ in the Lilien index. $(s < q < t)$ records the violation of conditions and therefore it uses the improved Lilien index (MLI) and it looks like this:

$$MLI_{s,t} = \sqrt{\sum_{i=1}^{n} x_{[is]} \cdot x_{[it]} \cdot \left(ln\frac{x_{[it]}}{x_{[is]}}\right)^2}\ ,\ x_{[is]} > 0, \qquad x_{[it]} > 0 \qquad (3)$$

If we take equality into account, then formula (3) can also be written as follows:$log_c\left(\frac{a}{b}\right) = log_c a - log_c b$

$$MLI_{s,t} = \sqrt{\sum_{i=1}^{n} x_{[is]} \cdot x_{[it]} \cdot \left(lnx_{[it]} - lnx_{is}\right)^2}\ ,\ x_{[is]} > 0, x_{[it]} > 0 \qquad (3)$$

In this, and [1].$x_{[is]} > 0, x_{[it]} > 0 \sum_{i=1}^{n} x_{it} = 1 \forall t$

In scientific research, it is noted that this index varies between 0 and 1. If the result is closer to 0, then there is no significant change in content, if the result is closer to 1, then it is emphasized that high changes have occurred in the content. However, in some sources, it is

noted that this index changes between 0 and 100, and it is noted that taking a value of 0 means that there are no structural changes and taking a value of 100 indicates the opposite structural change, and in some sources, it is stated that the minimum value of this index is equal to 0 and its upper limit does not exist

In his research, Nishi emphasizes that low values of the MLI index indicate slow structural changes, and high values indicate high structural changes.

4 Analysis and results

According to the analysis of the research, between 2010 and 2018, the share of production of agricultural products in the gross domestic product had a different trend of development. During these years, the share of the production of this type of product in the total gross domestic product fluctuates between 41.67 and 48.99 percent. In the period 2010-2018, the share of production of agricultural products in the gross domestic product reached its lowest level in 2010 (its share in this composition was 41.67 percent), and in 2017, these products in this composition production represented the highest indicator and its value was 48.99 percent (Fig. 1).

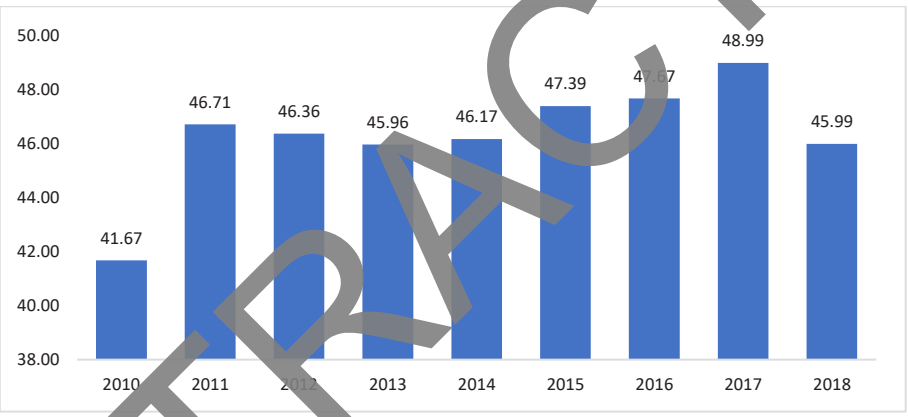

Fig. 1. Share of production of agricultural products in GDP (in percent)

In the structure of production of agricultural products in the period of 2010-2014, the share of the agricultural sector decreased, while the share of the livestock sector increased during this period. (Table 1).

Table 1. Changes in the structure of production of agricultural products (percent of total)

Production of agricultural products	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Farming	58,719	57,136	54,874	54,545	52,808	55,649	53,422	56,210	52,506
Animal husbandry	41,280	42,864	45,126	45,455	47,192	44,351	46,578	43,790	47,494
Total:	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

The results of the analysis show that agriculture has the largest share in the production of agricultural products (55.1 percent on average), and animal husbandry has the smallest share (44.0 percent on average). established production. Benchmark values for the production structure of agricultural products were formed based on the average values of the shares of

the annual production of agricultural products in the total production of agricultural products in the period 2010-2018 and expressed the following indicators (2 -table).

Table 2. Benchmark values for the composition of agricultural production

Production of agricultural products	Reference structure (average values)
Farming	55.1
Animal husbandry	44.9
Total:	**100**

According to the results of the empirical analysis, the values of the corresponding correlation coefficients between the formed benchmark composition of agricultural production and the composition of agricultural production during 2010-2018 expressed the following trend (Figure 2).

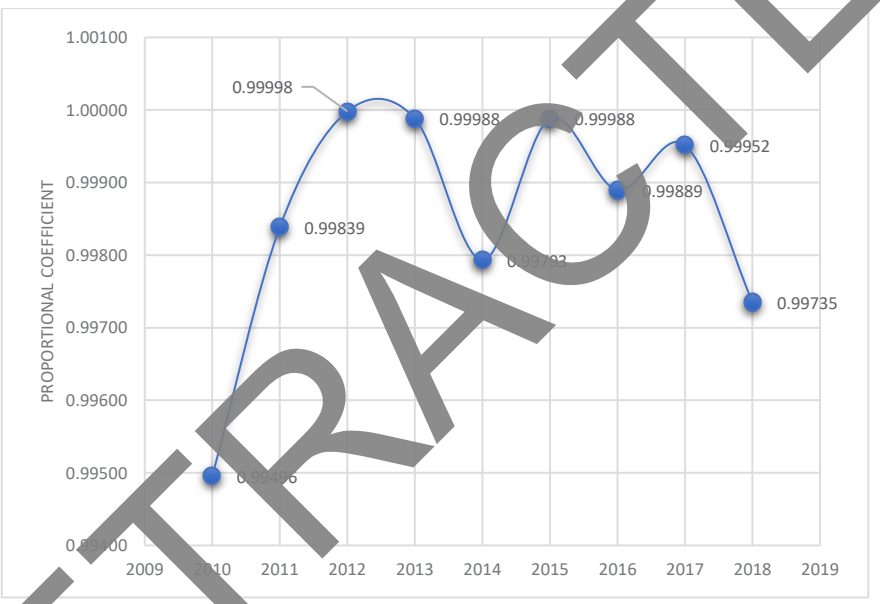

Fig. 2. The proportion of agricultural products production composition to reference composition formed in 2010-2018(in coefficient)

It can be seen from the ratio coefficients of agricultural products production that the highest value of this indicator was recorded in 2012 (the value of the ratio coefficient is equal to 0.99998 in the considered year), and the lowest value was recorded in 2010, i.e. 0 It was equal to .99496.

The analysis results of the study confirmed that the composition of total agricultural production in 2017 was effective compared to the composition of other years. The empirical values of the proportionality coefficient obtained in this year show that the production of agricultural products is very close to the reference composition.[2-7]

According to our calculations, the improved Lilien index (MLI) reached its lowest value (MLI index value 0.465) in 2012-2013, and its highest value in 2017-2018. Ida (the value of the MLI index is 5.237) (Fig. 3).

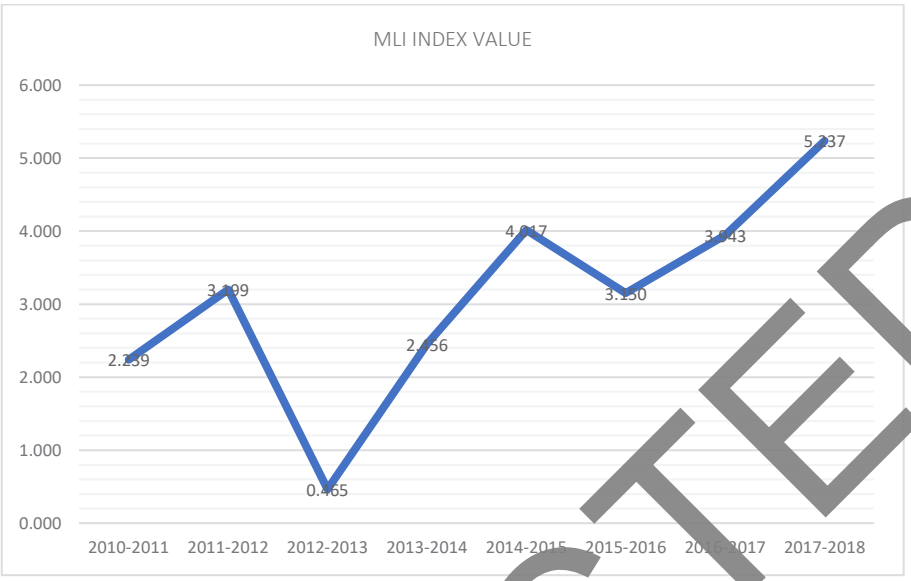

Fig. 3. Dynamics of general changes in the structure of production of agricultural products (change in MLI index values)

As can be seen from the dynamics of general changes in the structure of agricultural production, the value of the MLI index had a stable growth trend in the period 2012-2015. If we evaluate the dynamics of the MLI index based on the conclusions of Nishi's research, then it can be noted that the changes in the composition of the production of agricultural products in 2015-2018 were at a high pace.[8-15]

If we evaluate the changes in the dynamics of the MLI index based on the research of SM Okladnikova, then the structural structure of the production of agricultural products formed in 2012, to a lesser extent than its structural structure formed in 2013, and the production of agricultural products in 2010 it can be noted that the structural structure formed in 2011 differed to the highest degree from

5 Conclusions and suggestions

According to our scientific conclusions, the proportionality coefficient represents a numerical measure of the closeness between the content being evaluated and the standard content. This coefficient is equal to 1 when they are fully matched. If the value of the calculated proportionality coefficient is further away from 1, the content formed in the researched year differs from the benchmark content, and vice versa, the closer the proportionality coefficient is to 1, the more the content formed in the researched year is close to the benchmark content. Based on these considerations, the structure of agricultural production formed in 2017 was considered "the most effective" compared to the structures formed in other years.

Summarizing the above results, the share of agricultural production in the economy between 2010 and 2018 fluctuates between 41.67 and 48.99 percent. This, in turn, means that the development of the industry is stable. The share of agricultural production in this composition was 45.99 percent in 2018, which means that it is less than in previous years.

The general dynamics of changes in the structure of agricultural production confirmed the stable growth trend of the MLI index between 2015 and 2018.

Considering that agriculture is the most high-tech branch of the economy, the figure of 45.99 percent in 2018 is not enough in our opinion. In this regard, to increase the share of

this branch in the economy of our republic and the composition of GDP, it is necessary to introduce innovative developments to this branch. Also, based on the results of the research, we developed the following suggestions:

- Training of highly qualified personnel in this field and improving its quality;
- Wide involvement of innovative technology and foreign investments in the network;
- Deep processing of local raw materials in agriculture would be desirable.

In addition, in 2019, the "Strategy for the Development of Agriculture of the Republic of Uzbekistan in 2020-2030" was approved, which covers the following strategic priorities: ensuring the food security of the population; creating a favorable agribusiness climate and value chains; reducing the role of the state in managing the industry and increasing investment attractiveness; ensure rational use of natural resources and environmental protection; development of modern public administration systems; gradual diversification of government spending to support the sector; development of the system of information and consulting services in science, education, agriculture; the tasks of developing a transparent system of network statistics are defined. It is planned to achieve the following key indicators by 2030:

- Development of 1.1 million hectares of agricultural land, 535.6 thousand hectares of pasture, and other land use efficiency improvement;
- 1.7-fold increase in average labor productivity in agriculture (up to 6.5 thousand US dollars per employee per year);
- Increase the rate of recycled products to 30%;
- Increase exports to 20 billion dollars.

If all the tasks defined in the measures and strategies carried out by our state are fully implemented, if the system of personnel training in the agricultural sector is further developed, the country's economy will stabilize and be in line with further development.

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