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DEVELOPMENT OF AGRICULTURAL PRODUCTION IN ENSURING MACROECONOMIC STABILITY

Gulov M. O.
Professor Karshi Engineering-Economics Institute

Abstract
The theoretical foundations of empirical model construction and forecasting mechanisms using systematic analysis and digital technologies to ensure macroeconomic stability of agricultural production development have been improved. The level of effective use of the main production resources, or more generally, the level of use of the existing potential, in ensuring the macroeconomic stability of the development of agricultural production**.**
Key words: digital technology, empirical model, econometric model, potential, relative model, forecast results, information system, endogenous variables, exogenous variables.
Enter Strengthening macroeconomic stability and maintaining high economic growth rates aimed at further development and liberalization of the economy, increasing the competitiveness of the national economy, modernization and rapid development of agriculture, continuing institutional and structural reforms to reduce state participation in the economy, protection of private property rights and its priority the development of our country's economy by further strengthening its position, stimulating the development of small business and private entrepreneurship, comprehensive and proportionate socio-economic development of regions, districts and cities, improving the investment environment is considered an urgent issue.
As part of the wide-scale reforms implemented in all sectors in new Uzbekistan, special attention is being paid to the development of agricultural production and the provision of food to the population.
This article is based on the Resolution of the President of the Republic of Uzbekistan No. PQ-4477 of October 4, 2019, Resolution No. PQ-4643 of March 18, 2020 "On measures to further improve the management system of the agrarian and food sectors", Resolution No. PQ-4643 of October 25, 2019 Resolution No. 4499, Decree No. PF-6159 dated February 3, 2021 "On the further development of the system of knowledge and innovation in agriculture and the provision of modern services", the strategy for the development of agriculture of the Republic of Uzbekistan for 2020-2030, as well as other normative acts related to this activity - serves to a certain extent the implementation of tasks defined in legal documents. As the President noted, in the field of ensuring macroeconomic stability, it is planned to gradually reduce the annual inflation rate from 9% in 2022 to 5% in 2023, as well as to reduce the state budget deficit, which should not exceed 3% of the GDP starting from 2023. It is also planned to switch to the programmatic budgeting system. The civil budget was adopted, and based on the proposals of the population, 5% of the budget of each district was directed to solving urgent issues [13,14].

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Research Methods

Agriculture is a very complex system[4]. Therefore, it is impossible to create a mathematical description for the QXMICh process, to analytically express all the dependencies. This complexity can be simplified using a simple black box circuit. This makes it possible to quantitatively observe the changes in the output element of the system, taking the factors affecting the process as input elements. Here we can see the need for modeling in the development of QXMICh. With the help of macroeconomic modeling, we will be able to quantitatively evaluate the laws of development of QXMICh, determine the ways of development and forecasting based on the determination of trends in economic indicators [9].

In econometrics, the concept of relative model depends on gross product (U) consumption of resources in the enterprise (x1, x2, ..., xn) and it is written in the form Y=F(x1,...,xn).[5] Here (x1, x2, ..., xn) - free variables - are called factors. If in the relative model the inputs are chosen according to the consumption of resources, then this represents the production function. But factors affecting economic growth are not limited to resource consumption. There are sectors of the economy in which it is necessary to give a relative model with a wide range of factors.

The search for optimal production options in agriculture usually goes back to resource provision[6]. The organization of production on the basis of resource management is not perfected today. The reason for this is the complexity of calculations in the application of mathematical programming methods, the cyclic nature of problems, and others. Here, we believe that the improvement should be based on finite variability in the application of the mathematical programming apparatus.

Practical recommendations aimed at introducing the experience of developed foreign countries in the future and improving the efficiency of the development and management of agricultural production in the future based on econometric models were developed[10].

The urgency of solving the problems of agricultural development, improvement of product production in terms of quantity and quality can be justified by the importance of meeting the primary needs of the society. This is one of its distinguishing features among economic sectors.

The process of development and management of the production of agricultural products has its own laws. These laws distinguish the components of econometric models of development and management of agricultural production from relative models of economic processes of other sectors and are expressed on the basis of the interaction of economic indicators of agriculture. The volume of production - gross product Y depends not only on the consumption of resources in the production process, but the participation of many factors is observed here. So, the relative model can be expressed as:

$$Y = F(X_1, X_2, ..., X_k) \quad (1)$$

here *Xi*- *i*- set of type factors.

In order to increase the practical significance of equation (1) in the modern theory of building econometric models of the development of QXMICh, i.e., in order to ensure the exit from the situation of extreme complexity, it is necessary to form a complete set of independent variables X using the set of factors Xi. In this case, the set X is chosen not in the sense of a mathematical intersection of the sets

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Xi, but in terms of the interdependence of the elements of each set. $Y = F(X = \{ x_j^{(i)}, j = \overline{1,n}; i \le k \})$ (2)

Here n – number of selected factors.

It is distinguished by the fact that the numerous factors influencing in the process of KXMICh are more random compared to other sectors of the economy. Therefore, equation (2) when expressing stochastic relationships is written in the following form:

$$Y = F(X) + \varepsilon \quad (3)$$

Here ε - empirical model error. In the empirical models developed for the production process of agricultural products, one of the main tasks is to determine their structural variables. Although agriculture is considered one branch of the economy, it itself is made up of interrelated branches. Individual characterization of each of the indicators characterized in it is rare, that is, unrelated concepts are rarely observed. For this reason, the resulting amounts are often used in their valuation. This creates enough problems in determining the structural elements (variables) of the model. Therefore, in our opinion, it is necessary to form a group of factors separately when building macroeconomic models [9].

Nowadays, it is appropriate to research the laws of future development of agriculture with a new approach and multivariate modeling methods.

In our opinion, in the econometric modeling of the development and management of the production of agricultural products, it is necessary to distinguish the main issues of the process based on a systematic approach and summarize the resulting components. At the same time, we combine the problems that are poured into the modeling domain into four main objectives. In this, as organizers, we distinguish the issues of optimization, determination of production potential, ensuring the stability of the production system, and multi-factor econometric modeling [10].

There are different interpretations of the concept of optimization in the development and management of the production of agricultural products.

In the 1st case, the concept of optimization characterizes the planning of the activities of the smallest unit in the production of agricultural products, that is, the production entity (in our case, the farm is chosen) aimed at the maximum benefit from the production of products depending on the production resources.

In the 2nd case, it is manifested in indicators that are valued by evaluating the level of effective use of the main production resources at the regional level, or more generally, the level of use of the existing potential.

In the 3rd case, the comparison of econometric models of development and management of agricultural production has acquired a special meaning.

Currently, one of the important issues of studying the process of agricultural production is a systematic approach [11]. The importance of the systematic approach is that when analyzing the existing problems and their causes, it is not enough to observe a specific economic process in the network to make a final decision. For example, the production function is used in the studies of the agricultural sector at the

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national level. In this case, they are limited to drawing primary conclusions based on the model built on labor resources and capital expenditure from the production function of the Cobb-Douglas form. When calculating forecast indicators, although the models using only capital and labor resources have high adequacy, the obtained results cannot be concluded as high accuracy. In modern modeling, the Cobb-Douglas production function has acquired the form of the trend of growth of technical production over time, determined by the efficiency of production organization and management, connected with technical processes.

One of the most important tasks of agricultural production development is to increase the efficiency of using the existing potential. But the main issue here is to express the production potential in one model and determine the effectiveness of using the potential through it. If this issue is considered at the scale of the entire region, the process becomes more complicated. Also, the selection of arbitrary variables of the model, that is, the identification of potential structural elements, causes enough problems. In other words, it is possible to develop such a model so that this model can describe the laws of agriculture, and the model should include such arbitrary variables that these variables represent the value of individual factors that have a key role in the production process in a systematic way.

We selected the main production resources, taking into account the possibility of their costs increasing, developed an overview of the kinetic production function, and built specific models of this function for the Kashkadarya region. We also found that the Cobb-Douglas type production function can be used only if there is no cost overrun.

The general view of the kinetic production function for agricultural production that we have proposed is as follows, i.e.

$$Y_k = \frac{A_k \cdot Y}{a_0} = A_k \cdot \prod_{j=1}^{n} x_j^{\alpha_j} \cdot e^{a_j x_j} \quad (4)$$

is represented by the equation Based on (4), we used the following model to evaluate the effectiveness of using the existing potential in the production of regional agricultural products in a private case

$$Y_k = \frac{A_k \cdot Y}{a_0} = A_k \cdot \prod_{j=1}^{4} x_j^{\alpha_j} \cdot e^{a_j x_j} \quad (5)$$

Here Y is determined from the following equation $\ln(Y) = \ln(a_0) + \sum_{j=1}^{4} a_j x_j + \sum_{j=1}^{4} \alpha_j \ln(x_j)$,

(6)

also x_1 – agricultural land area (thousand ha); x_2 – average number of workers; x_3– annual average value of the main production funds; x_4 – amount of working capital (billion soums); Y is the volume of gross agricultural output (billion soums).

(5) in the model - the elasticity of the j-free variable ( ), - the coefficient representing the change (increase or decrease) of the resulting quantity in relation to the amount of this factor for a 1 percent change (increase) of the j-factor ( ), - the proportionality coefficient. The proportionality coefficient will

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not have any content (do not participate) in the basic model.

(6) if we pay attention to the structural structure of the linear equation, the xj resource in its content comes with its logarithmic value. Practically, if a state of disequilibrium is observed in any of the production resources, in model (6) this resource comes with its logarithmic value. In this case, it is necessary to reduce or increase resource consumption. This can be expressed in the following relation

$$c = \alpha_j + a_j x_j, \ j = 1,2,...,4. \quad (7)$$

If in (7) is not equal to zero, the optimal state of the j-resource amount sufficient for the growth of the production volume (Y) is determined by the ratio.

If the multiplier in (7) is zero, then a 1 percent increase in j-resource means a direct percent increase in Y (must always be positive).

If equal to zero, then a 1 percent increase in resource j means a direct percent increase (or decrease) in Y. More precisely, if it is negative, the increase in the amount of the resource is accompanied by a decrease in the efficiency of its use (resource use efficiency is low on average), and a 1% increase in the j-resource represents a direct percentage decrease in Y. Also, in model (5), every resource is

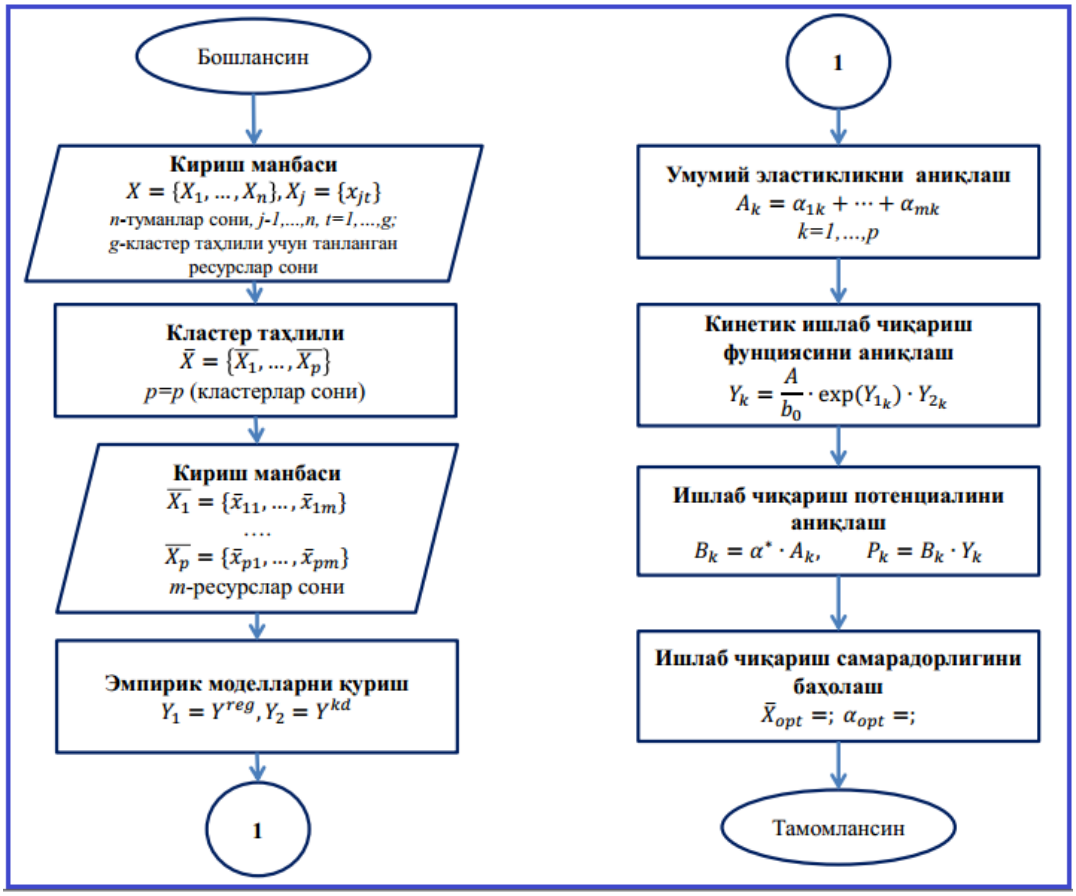

Figure 2. Algorithm block diagram for solving the problem of evaluating the efficiency of the use of agricultural production potential

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Thus, we can describe the algorithm for solving the problem of assessing the level of effective use of agricultural production potential (Fig. 2). The given algorithm is linear, which makes it more understandable. While certain conditions and repetitions are observed during the process of solving the problem, this is not particularly important since each step of the algorithm is a small process. This means that the modeling process is based on a linear algorithm.

SWOT analysis of agricultural development of Kashkadarya region was conducted in the study (Table 1).

SWOT analysis of agricultural development of Kashkadarya region

STRENGTHS	**WEAKNESSES**
✓ ☐ the implementation of special agricultural reforms for the development of agriculture and the creation of legal bases; ✓ ☐ adoption of a separate Law "On Agriculture" for the development of agriculture; ✓ ☐ On the basis of the law, he was formed as the owner of land and property; ✓ ☐ the introduction of agriculture into the form of entrepreneurship and the satisfaction of the main link of the society, the public interest; ✓ ☐ that peasants and farmers have fully developed the skills of working with land; ✓ ☐ quick flexibility as a small commodity producer, not prone to bankruptcy; ✓ ☐ that the activity is aimed at earning income.	✓ ☐ lack of improvement of necessary economic mechanisms for agricultural development; ✓ ☐ today there is no clearly regulated, convenient supply system for agriculture; ✓ ☐ provision of agricultural resources with necessary resources is mainly carried out by private individuals; ✓ ☐ limited access to quality resources for agriculture; ✓ ☐ lack of interest in increasing the economic literacy of the villages, they consider it enough if they know how to work with the land, and as a result: ✓ ☐ the number of farms with legal status is decreasing day by day. ✓ ☐ lack of necessary technical means, violation of mutual cooperation relations with other economic subjects, lack of system of purchase of cultivated products.
OPPORTUNITIES	**THREATS**
✓ ☐ the increasing interest of the rural population as a result of the increase in the indicators of agricultural economic efficiency; ✓ ☐ the number of employed people in the village is increasing at the expense of agriculture; ✓ ☐ increasing possibility of attracting local investments; ✓ ☐ consistently high quality index of farms specializing in animal husbandry; ✓ ☐ that the state continuously adopts measures and programs supporting agriculture.	✓ ☐ increasing number of people engaged in business in the field of agriculture; ✓ ☐ the fact that agricultural farms are always pronounced side by side with private estates and households, which leads to the conclusion that all three farms can be combined into one; ✓ ☐ that the interest of the village is partially satisfied at the expense of "speculators"; ✓ ☐ sharp decrease in the number of farms in desert zones.

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Through the SWOT analysis, it will be possible to understand what needs to be paid attention to in the organization of regional agriculture, and the importance of agriculture in satisfying the interests of the family, society and the state. In particular, our citizens who want to organize agriculture start their work knowing that agriculture is protected by the state, that there is a legal basis, and that they are satisfying the interests of their families and the population through their chosen work. The results of the SWOT analysis will also help other agricultural enterprises operating in the region to know the situation of their competitors, because in the analysis, the agricultural enterprises will also list their strengths and weaknesses, opportunities and threats.

Result and Discussion

Trend models were developed to assess the development of the agricultural production process. In order to assess the development, the indicator of the production potential of the region, the indicator of the inter-sectoral relative dynamics of the production of agricultural products, the indicator of the structural dynamics of all categories, the indicator of the change trend of the share of auxiliary farms in the total production of agricultural products, the indicator of the change trend of the share of the agricultural farms of the region in all categories of total vegetable products the indicator of the dynamics of the change of the share in relation to the volume of cultivation, the indicator of the dynamics of the potato productivity coefficient, the indicator of the specialization coefficient were selected.

The production potential of the region is determined based on the share of the volume of production of a certain type of products in the volume of products of this type on the national scale. Also, this indicator is observed in certain periods. Therefore, when assessing the potential of Kashkadarya Oblast, we are based on the share of the volume of agricultural products produced in the past periods (years) in the volume of agricultural products produced on the republican scale in the corresponding periods (years). The historical share indicator provides an indication of the region's achieved production potential, but it does not reflect the future situation. For this, it is necessary to know according to which law the line of development continues, based on the current principles, priorities, mechanisms of action introduced into the production. The fact that these laws have a dynamic nature means that they are expressed in dynamic models. For this reason, we use trend models to evaluate the potential of the regional QXMICh in the next steps.

The importance of this indicator characterizes the resulting size in forecasting using the development models of QXMICh.

The trend of the share of the volume of regional GDP in the republic in relation to the size of the total agricultural products in the last twenty years is estimated using the trend model in the form of a 5th order polynomial (Fig. 3). The top-of-the-line model does just that.

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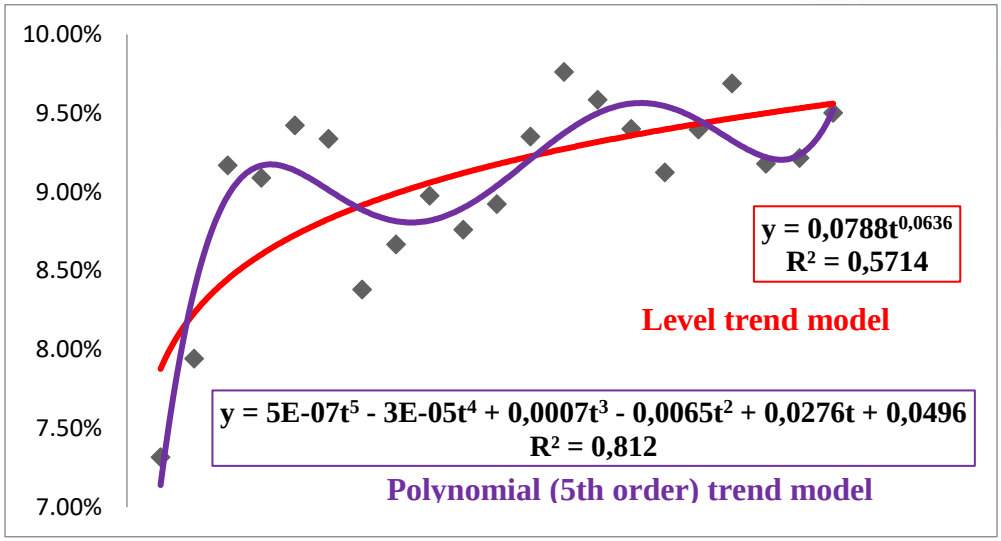

Figure 3. Trend models of the evaluation of the potential of the KSHMICh of the Kashkadarya region

The coefficient of determination is 0.812. Next is the graded trend model, with a coefficient of determination equal to 0.57. Other types of trends are not recommended, for example, for a linear trend model, this indicator is equal to 0.31. Therefore, we accept the trend model in the form of a 5th order polynomial in the assessment of the trend of change of the volume of the region's GDP in relation to the size of the total agricultural products of the republic. According to it, we will calculate the region's share for 2021-2025. As a result, we get the following, respectively: (7.14%; 8.39%; 9.05%; 9.36%; 9.54%). Also, in the next decade, the share of the region will be 12.56 percent. It can be seen that the final indicator of the development of the region's economic development will have the characteristic of strict monotony in the next years, that is, a line of continuous growth over the years.

We use the smoothed values of specialization coefficients to determine the trend model. In order to estimate the specialization coefficient of farmers and peasant farms in Uhol, we identify the following trends:

$$K_{c.(f/x)} = 0,0003t^2 + 0,0012t + 0,9524 \quad (7)$$

$$K_{c.(\partial/x)} = 0,2609 \cdot \exp(0,0022 \cdot t) \quad (8)$$

The coefficient of determination for the trend model (7) is 0.97, the value of Fisher's criterion is 258.7, and for the model (8) these indicators are 0.91 and 80.9. Therefore, the obtained trend models are reliable.

Using trend models (7) and (8), we have the opportunity to forecast the specialization coefficient of farmers and peasant farms in the following years.

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Table 3. Forecast indicators for the specialization coefficient of farmers and peasant farms for 2024-2028

Indicators	Forecast years					Average value
	2024	2025	2026	2027	2028	
Agricultural specialization coefficient	0,9539	0,9560	0,9587	0,9620	0,9659	**0,9593**
Agricultural specialization coefficient	0,2615	0,2621	0,2626	0,2632	0,2638	**0,2626**

The average value of the coefficient of specialization for the next five years is 0.9593 for farms. This indicator is 0.2626 for agricultural holdings.

Summary

From the results of the forecast, we can see that the gross harvest of the main grain products corresponds to the share of farms. Farming of livestock and poultry products will remain stable. This means that currently, cattle breeding, sheep and goat breeding, and poultry farming are the basis of agricultural holdings.

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