



## Article

# Systematic Imitation Modeling Of The Development Of Production Of Agricultural Products

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**Abstract:** A mathematical model of the development of production of agricultural products was developed through an imitation model. As the population grows, the demand for agricultural products increases. The introduction of innovative technologies in the sustainable development of this sector and increasing the volume of agricultural products with rational use of resources is gaining importance. In this article, the analysis of the current situation, perspective indicators and the main directions of innovative development are developed through the simulation model of the development of the agricultural network.

**Keywords:** Agricultural Economy, Imitation Model, Innovations, Innovative Activity, Innovative Processes, Forecast, Imitation.

## 1. Introduction

In the context of the ongoing global integration process, safeguarding the nation's food security necessitates a sector that is adaptable to external fluctuations, proficient in diverse technologies, and grounded in sustainable agricultural growth. Consequently, in numerous industrialised nations, the contemporary phase of agricultural advancement is characterised as a move towards an inventive model that facilitates the systematic integration of the agricultural sector with the scientific and technology sectors to enhance its efficiency. To optimise production and distribution systems and implement innovative business models that facilitate the efficient utilisation of land, energy, and other natural resources while addressing the needs of the impoverished global population, the establishment of "smart agriculture" is essential.

It is considered appropriate to use it in improving the activities of agricultural holdings, including:

- concluding agreements with the state on the purchase of farm products and ensuring that some of the products are purchased by the state at high prices;
- in order to support the domestic market of the country, state incentives for farms producing low-profitable products;
- economic stimulation of farms that have effectively used agricultural land, improved land reclamation, and organized production based on the use of alternative energy sources;
- preservation of production traditions based on specialization in agriculture;

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- improvement of cooperative relations based on the principles of mass cooperation and allowing farmers to operate as members of several associations and cooperatives;
- the existence of state quotas for potatoes, which are considered the most necessary food products;
- availability of the right to obtain a patent for farms that are engaged in providing services for the production of agricultural products, not production;
- the existence of traditional efforts for the education of farmers in the future, including the organization of master classes, thematic clubs, experimental fields on the basis of various agricultural associations;
- the development of the "Smart" software methodology in order to increase the competitiveness of agricultural products, improve the environment and rural conditions, the quality of life in the countryside, and diversify the agricultural economy;
- to encourage and improve the activity of family farmers as the main cooperative subject in the agro-food complex;

## 2. Materials and Methods

Amidst the socio-economic transformations occurring globally and the process of international integration, Khamraeva S.N. asserts that the agriculture sector must transition to a novel inventive development trajectory. This approach will create opportunities to enhance the status of farmers based on contemporary technical and technological ideas.[1]

Joseph Schumpeter, the Australian economist-scientist, is prominently recognised in several economic texts as a pioneering figure who significantly contributed to the description and classification of inventive processes, as well as the overarching theory of innovative activity. During that period, invention was not acknowledged; yet, terms such as "effective method," "innovation," "effect," and "application"[2] were employed in economic progress..

We use simulation modeling to develop information support. In contrast to the analytical model, the simulation model refers to the extended scheme that shows the behavior and internal structure of the object being studied. Processing of the events expressed in the model, preserving their logical structure, time sequence, relationships between the variables and parameters of the studied system, is characteristic of the simulation model. According to Abdullaev A., Imatov M., Haydarov M. and Ashurova D. "Imitation models are designed to obtain information about the modeled system and to develop an assessment for decision making"[3].

Berkinov B. and Mukhitdinov H.S. discuss enhancing the populace's level of living through the advancement of the agricultural network. He proposed that "to establish an automated information base for modelling the development of social processes in regions, imitation indicators and systematic management modelling methods are beneficial"[4]. Simultaneously, researchers Kharin Y.S., Malyugin V.I., and Kirlitsa V.P. have acknowledged the inherent deficiencies of this system. The limitations in flexibility and the restriction to a certain type of statistical modelling are warranted [5].

### Research methodology

This scholarly study examines the research conducted by both international and domestic economists about innovation, the implementation of imitative activities in the sustainable growth of economic sectors, particularly agriculture, and the creative advancement of the agricultural sector. Statistical data grouping, comparative analysis, monographic observation, and mathematical modeling methods were used based on the information of the Statistical Committee of the Republic of Uzbekistan, the Statistical Department of Kashkadarya Region.

### 3. Results and Discussion

In the implementation of the model, the need to use modern information technologies is clearly visible at the first stage of introducing the data processing system. The architecture-structuring mechanism of the database management system has now reached such a level that it allows the implementation of the user interface using various application software packages.

Forecasts on the development of the quality of agricultural products cover the regions of the region and serve to mitigate the differences between their economic development and the living standards of the population.

One of the most important general conclusions that may be necessary for the strategy is that it is intended to pay special attention to the implementation of programs that will improve the quality of agricultural products.

The projects accepted as a component of the strategy for the development of the agricultural network in Kashkadarya region are in accordance with the long-term goals of technological modernization and the formation of human resources, directing investments to the well-being of the people in order to increase the quality of the level of the agricultural economy.

Since the agricultural sector is a complex process, it requires the analysis and implementation of new approaches, economic-mathematical models and methods for forecasting the development of the agricultural network.

A mathematical model never fully embodies the properties of the object being studied. It is approximate in nature as it is constructed on the basis of various assumptions and limitations. Therefore, the results based on it will be approximate. Accuracy of the model, assessment of the level of reliability of the results is one of the main issues of information provision.

A simulation model can be provided using various means. These tools include steps from constructing differential and integral equations using functional analysis elements to writing computational algorithms and EHM programs.

Each stage has its own impact on the final result, and the errors that occur in it are also determined by the errors that occurred in the previous stages.

Naturally, our goal in systematic analysis is economic  $\partial$  – in determining the performance indicator  $\theta$  – is to calculate by reaching the level. We can define this as the following base two logarithm efficiency:

$$\partial = -(1 - \theta) \quad (4)$$

Here:  $\partial$  – natural efficiency indicator of satisfying the population's needs for agricultural products (utility character of the object);  $\theta$  – the level of indicators of satisfying the population's needs for agricultural products (the level of need satisfaction);  $(1 - \theta)$  – the possibility that the goal will not be achieved.

As we can see from the formula, depending on how high the level of economic efficiency is, the level of satisfying the needs of the population for the agricultural network also increases.

If the need is fully satisfied,  $\theta=1$  (which of course will never be complete) efficiency is infinite  $\partial_0 = \infty$  will be. If the need is half satisfied, that is  $\theta=0,5$  If, then efficiency  $\partial=1$  will be. If the population needs  $\theta=0$  if not satisfied,  $\partial=0$  efficiency will be zero.

**Look at the first imitation model** - is the main purpose of decision-making for the introduction of new techniques and technologies into agricultural sectors, and is based on the impact of the assessment level. At the stage of analysis of their development by introducing new techniques and technologies into agricultural industries, adapting and evaluating each innovation at the level of introduction, achieve the goal  $\theta'_i$ , probability of use  $\varphi_i$  and  $\partial_i$  is calculated with the potential of innovation

$$\partial_i = -\varphi_i \log \log (1 - \theta'_i) \quad (10)$$

Here:  $\theta'_i$  – the goal of achieving the probability that is used in order to introduce new techniques and technology for the development of the agricultural economy;  $\varphi_i$  – the

possibility of using accurate data entry during the introduction of new techniques and technology, appropriate behavior.

In this case, the default probability is not appropriate,  $\theta$  ( $1-\theta$ ) turns into.  $\theta'$ ,  $\varphi$ ,  $\partial$  it is possible to obtain a comparative assessment of the impact of the introduction of new techniques and technologies.

**The second view of the imitation model** - based on comparative analysis of farming systems. Two dimensions can be used to transform data during evaluation  $\partial_i$ :

the first one  $\theta'_i$  – through probability;

the second is through determinant means of receiving information;

introduction of new techniques and technologies for agricultural development;

using the arithmetic mean value  $\partial_i = \frac{\omega_i}{n_i}$ ;

we use the following formula in the process of introducing new techniques and technology for the development of agriculture and its dynamic change:

$$\partial_i = \frac{\omega_i}{n_i} + \frac{\tau_i d\omega_i}{dt} + \frac{\delta_i d^2\omega_i}{dt^2} \quad (11)$$

Here:  $\omega_i = \frac{A_i}{\Delta A_i - A_i}$  the following data are used in the calculation of the application, the size of the farm and the number of services are interpreted on the computer.

The simulation model is often used to determine whether new techniques and technologies have been used in farming, whether new forms of farming have been formed, etc.  $\Delta A_i$  – description of the calculation of the level of accuracy of the impact of the introduction of new techniques and technology for the development of the agricultural economy;  $A_i$  – calculation of the impact of the introduction of new techniques and technology for the development of agriculture in specific time conditions;  $\partial_i$  – calculating the amount of data input to the computer to achieve the required potential;  $\frac{d\omega_i}{dt}$  – determining the rate of introduction of new technologies;  $\tau_i$  – minimum time to introduce new technologies;  $\frac{d^2\omega_i}{dt^2}$  – increase the speed of introduction of data entry;  $\delta_i$  – feedback description of the system.

Two methods of simulating the level of farming are used here.

$\partial_i$  – accuracy  $\partial_i \theta_i$  - and measured  $\omega_i$  calculate the  $n_i = \frac{\omega_i}{\partial_i}$  is equal to.

In that case  $\theta'_{ik}$  - by assessing forecasting,  $\theta'_{it}$  – used according to the assessment during the control of the introduction of new techniques and technologies.

And in evaluating the importance of criteria  $\partial_{ik}$  and  $n_i$  can be calculated by.  $\omega_{it}$  the determination in different calculations at each minute of time takes the following form:  $\partial_{it} = \frac{\omega_{it}}{n_i}$ . This is the total number of matches per minute of total calculations.  $n_i, \partial_{it1}, \partial_{it2}, \dots, \partial_{itj}, \dots$  – calculation size for each detection criterion. Thus, the management process is constantly changing.

It presents the summation of the interaction of system elements, ensures the achievement of the expected result in a short period of time, low financial and economic costs with less work, less damage to the environment, aims to approach new techniques as a complex object. It is interpreted as the study of the object as a whole, and on the other hand, as a part of a larger system, the object under analysis located between the rest of the systems in use, in a defined relationship. In this case, the principle of systematicity covers the object and subject from all sides.

#### 4. Conclusion

In summary, the imitation model has advantages over other models in statistical modeling. At the same time, analyzing and processing the results of statistical modeling is important in modeling the economic growth of the agricultural sector. In addition, in these processes, the correct selection of software, ensuring the reliability and completeness of data on agricultural activities is important in the correct assessment of the economic efficiency of their activities through statistical modeling.

Factors impeding progress include inadequate demand from producers for innovative developments by scientists from higher education and research institutions, a lack of organic connection between these entities, the irresponsibility of certain agricultural product producers, and challenges related to innovation in agriculture.

The challenges of innovative development are particularly significant for Uzbekistan, as the extensive and effective implementation of new resource-efficient, advanced technologies is essential for fostering rapid economic stability while considering environmental preservation.

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