Development of a model for the transformation of agriculture in the digital economy

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Abstract. The article is devoted to the study of the development of theoretical and methodological aspects of the formation of organizational and methodological tools necessary for the competent and effective implementation of a multi-level strategy for transforming the structure of agriculture in the context of the consistent development of the digital economy. The scientific novelty of the ongoing research is the development of a methodological set of tools necessary for the implementation of the strategy of transformation of agriculture in the innovative economy. The hypothesis of the study assumes that the transformation of the structure of agriculture in the environment of digital transformations cannot be carried out in a short period of time, full implementation is possible only if the transitive approach is integrated, which is considered as an independent stage of the transformation of agriculture. The authors propose a methodology that allows the implementation of agricultural transformation models operating in the context of the transition to the digital economy paradigm, which includes a sub-methodology that allows one to obtain a preventive assessment that shows the level of readiness for digital transformation of various public authorities.

1 Introduction

The growing impact of a wide range of modern problems, caused not only by the influence of crisis processes of a global nature, the growing level of disproportion in a number of key sectors of the national economy, but also the digital transformation being carried out in the country in a number of key areas of life, have greatly contributed to the actualization of the search for effective and competent decisions regarding the transformation, in the context of such a vital sector as agriculture. One of the most pronounced global trends that have determined the development of agriculture in recent years is the increase in the level of application of various groups of multilevel digital technologies [1]. However, at the same time, the structural composition of the elements included in the structural contour of the transformation mechanism in the context of the development of the digital economy is still not defined, and its content contains many contradictions, while only groups of factors remain constant that form an objective need for transformation, to ensuring the country's food security. Modern realities associated with a consistent transition process of the economy to a multi-level management system, which is built on the use of many information arrays created

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by digital tools/technologies, already now involves the reorientation of previously formed targets, mechanisms, technological solutions, and methods of transformation, since the current the practice does not allow to make a qualitative innovation and technological step forward within the industry. The development of digital technologies, their rapid integration, as an existing regularity in the operation of complex economic systems in modern realities, requires the formation of a conceptual methodological justification for the work of processes associated with digital transformation, considering a few features associated with the peculiarities of carrying out transformations of this type in the context of the development of a digital model economy. It is necessary to determine and consider the level of readiness of subjects working in agribusiness, sectoral management systems for digital transformations.

The purpose of the study is to develop the theoretical and methodological aspects of the formation of organizational and methodological tools necessary for the competent and effective implementation of a multi-level strategy associated with the transformation of the structure of agriculture in the context of the consistent development of the digital economy [2]. The goal set determined the setting of the following tasks determining the structure and logic of the study:

- to form a methodology for the practical implementation of an updated version of the multi-level model for the transformation of agriculture, taking into account the initiation of the process of transition to a digital economy;

- to develop a methodology for "D.I.K.O.T.A.S.-analysis" reflecting a digital profile of the level of readiness of agribusiness entities and the government of the region to integrate a complex of digital technologies.
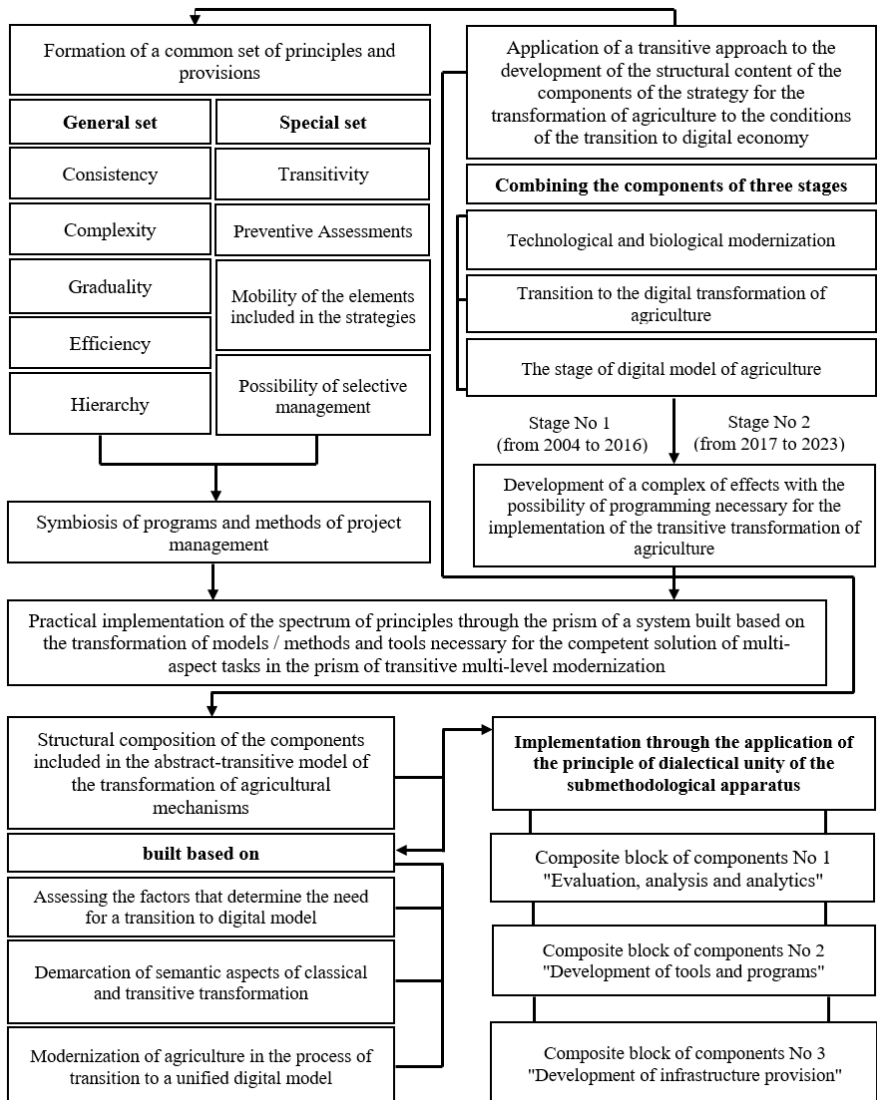
2 Research methodology

The methodological basis of the study is based on scientific works and specialized applied developments of foreign and domestic experts in the field of agricultural transformation. The authors used the conceptual provisions included in the theory: updates, changes in production and technological patterns, development of strategic aspects in the field of state regulation in the agricultural sector, including the range of its industries. The application of these provisions made it possible to synthesize the key directions for the transformation of the structure of agriculture, considering the consistent development of the digital economy, which made it possible to select the most priority sets of options for their subsequent practical implementation [3].

The working hypothesis of the study is the assumption that the transformation of agriculture in the environment of digital renewal is not carried out all at once, i.e. for its effective implementation, a transitive period is needed, which is advisable to consider from the standpoint of an independent, independent stage in the renewal of agriculture, due to the complexity of digital transformation processes and the presence of a certain resistance on the part of agriculture to changes of this kind. In the context of the transformation, the existence of a transitional period will significantly increase the level of readiness of all groups of stakeholders and subjects, without exception, which will allow them to be fully provided with the set of resources required for implementation, which as a result will allow for a smooth transition to a comprehensive integration of digital technologies and solutions into the structural contour of agriculture [4].

3 Results and discussion

The methodology proposed by the authors is based on a synthesized set of definitions that are designed to change the current conceptual apparatus regarding the transformation of

agriculture in the context of a consistent transition to a digital economy. The universality of the methodology proposed by the authors lies in the possibility of using it for a wide range of multi-aspect tasks, within the framework of the ongoing systemic transformations in the structure of agriculture, within the boundaries indicated by the contour of the formed sectoral strategy, because of which specific features were formed regarding the theoretical and methodological aspects of the implementation of tools and provisions. Figures 1 and 2 show the components included in the methodology proposed by the authors for conducting digital transformation in the structure of agriculture as part of the implementation of the digital economy model.

Source: compiled by the authors basing on the research results.

Fig. 1. Fragment "A": Components of a methodological approach to the practical implementation of transformations in agriculture in the doctrine of the development of a digital model of the economy.
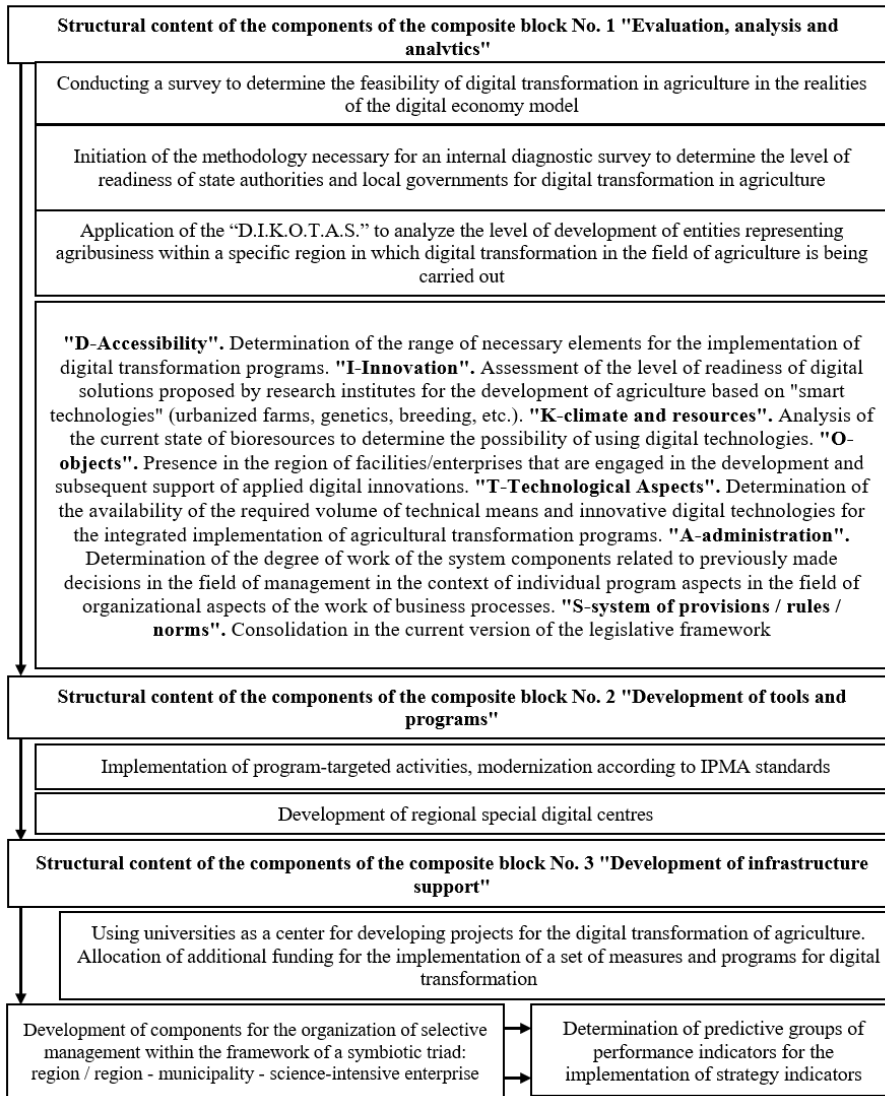
Structural content of the components of the composite block No. 1 "Evaluation, analysis and analytics"

Conducting a survey to determine the feasibility of digital transformation in agriculture in the realities of the digital economy model

Initiation of the methodology necessary for an internal diagnostic survey to determine the level of readiness of state authorities and local governments for digital transformation in agriculture

Application of the "D.I.K.O.T.A.S." to analyze the level of development of entities representing agribusiness within a specific region in which digital transformation in the field of agriculture is being carried out

"D-Accessibility". Determination of the range of necessary elements for the implementation of digital transformation programs. **"I-Innovation".** Assessment of the level of readiness of digital solutions proposed by research institutes for the development of agriculture based on "smart technologies" (urbanized farms, genetics, breeding, etc.). **"K-climate and resources".** Analysis of the current state of bioresources to determine the possibility of using digital technologies. **"O-objects".** Presence in the region of facilities/enterprises that are engaged in the development and subsequent support of applied digital innovations. **"T-Technological Aspects".** Determination of the availability of the required volume of technical means and innovative digital technologies for the integrated implementation of agricultural transformation programs. **"A-administration".** Determination of the degree of work of the system components related to previously made decisions in the field of management in the context of individual program aspects in the field of organizational aspects of the work of business processes. **"S-system of provisions / rules / norms".** Consolidation in the current version of the legislative framework

Structural content of the components of the composite block No. 2 "Development of tools and programs"

Implementation of program-targeted activities, modernization according to IPMA standards

Development of regional special digital centres

Structural content of the components of the composite block No. 3 "Development of infrastructure support"

Using universities as a center for developing projects for the digital transformation of agriculture. Allocation of additional funding for the implementation of a set of measures and programs for digital transformation

Development of components for the organization of selective management within the framework of a symbiotic triad: region / region - municipality - science-intensive enterprise

Determination of predictive groups of performance indicators for the implementation of strategy indicators

Fig. 2. Fragment "B" Structural content of the blocks in the framework of the proposed methodological approach.

A distinctive feature inherent in this methodology is the presence in it of dialectical unity, built on the synthesis of two sub methodologies, which became possible through the competent application of a transitive approach to issues related to the formation and implementation of strategic transformations in the context of the digitalization of the economy [5]. The set of components included in this methodology, also including a separate range of tools for sub methodologies, makes it possible to form the theoretical and scientific basis necessary for the effective implementation of the components of the strategy used to carry out transformations in agriculture [6]. The proposed methodology makes it possible to obtain a comprehensive assessment of the degree of influence of groups of processes associated with digitalization in the framework of agriculture, allows you to determine the degree of readiness of stakeholders to integrate digital solutions, determine the indicator of innovative activity for each individual economic entity, identify and determine the degree of

need for the availability of those or other resources, determine the conditions for the emergence of obstacles that hinder and impede the implementation of the transition to digital technologies.

Analysis methodology "D.I.K.O.T.A.S." allowing to determine the profile and degree of the possibility of integrating a complex of digital solutions/technologies by the subjects of the agricultural business, involves the following stages [7]:

- selection (determination of groups of enterprises based on a system of criteria indicators);
- qualitative assessment (determining the readiness of groups of parameters on the basis of a qualitative assessment for the integration of digital technologies through the use of a scoring method);
- content (assessment of quantitative indicators for the main 7 elements included in the "D.I.K.O.T.A.S.";
- subjects and industry (determining the level of readiness of the region to initiate programs of complex transformation) [8];
- policy recommendations (development of a practical set of recommendations based on the information received as a result of the methodology).

Analytics blocks are used at all stages of the D.I.K.O.T.A.S. analysis methodology, which allows taking into account the peculiarities of using heterogeneous groups of indicators in order to determine the hidden potential inherent in the processes associated with digital transformation at various levels (in this case, we are talking about macro / micro levels) and directions for subsequent transformation, it also becomes possible to take into account the current situation of the agricultural sector, taking into account current economic realities [9]. The proposed methodology makes it possible to obtain effective organizational and economic groups of regulators of the transformation process in agriculture, considering the period of transition to a digital model of the economy, based on the identification of a few typological groups that characterize the level of readiness of state authorities, economic entities of the region and the population to conduct a comprehensive digital modernization. The practical implementation of transformations involves ongoing monitoring control within the framework of the sectoral management system at the level of both the region and the municipality, which is based on the analysis of experience related to the modernization in agriculture, while it is also necessary to consider the degree of consistency of decisions made in the field of control [10]. The methodological approach will allow to fully implement the systemic nature inherent in it, because of which the relevant information is developed, which is necessary for the formation of a strategy for the transformation of agriculture as part of the organization of a consistent transition to a digital model of the economy. In turn, conducting an internal diagnostic survey of a multi-level system of regional management institutions, in matters relating to experience in carrying out transformations in the agricultural sector, requires an appropriate analytical justification in the context of several areas [11]:

- presence in sufficient quantities of all the necessary polymorphic resource groups, which should be evenly distributed over the entire time period during which the digital transformation will take place;
- determination of the level and nature of the organized interaction between objects and subjects within the ongoing digital transformation;
- formation of the structure of the management mechanism and practical tools necessary for the practical implementation of multi-aspect digital transformation programs;
- determination of the quality level of the proposed set of initiatives within the formed portfolio, concerning the range of programs related to the transformation of the structure of agriculture;
- organization of permanent control/monitoring of the implementation of multi-aspect programs aimed at the transformation of agriculture [12].

For each individual subject area discussed above, an assessment complex should be developed that will allow diagnosing the level of development of a region or municipality in order to establish readiness for the implementation of digital transformation, followed by diagnostics of the decisions made by the scoring method.

4 Conclusion

The practical implementation of the components laid down in the strategy for the transformation of agriculture is impossible without the availability of appropriate scientific personnel, which certainly requires already now the development of a mechanism for organizing inter-level interaction between specialized universities and representatives of agribusiness in the field of resolving issues related to the training of specialists with the necessary and relevant set of competencies to work in the agricultural sector in the context of digital transformations being carried out in it.

The methodology proposed by the authors for conducting a study of groups of processes associated with changes and transformation is built on the basis of levels that are implemented due to the dialectical unity of two sub methodologies (the formation of a preventive assessment of the level of readiness for carrying out work related to digital transformations of both business entities and public authorities and sub methodology associated with the development of adaptive transformation strategies at the regional level). The blocks of the methodology are differentiated according to the time parameters of implementation, considering the transitional stages to the digital model of the economy, which makes it possible to conduct a diagnostic survey in order to more effectively achieve dominant indicators in the formation of the planning horizon for the future of agriculture. Planning in this case involves the development of mass integration of robots in agriculture, collaboration with the IT sector, the implementation of management programs based on working with big data, and the formation of multi-level interdisciplinary communications.

Method of analysis "D.I.K.O.T.A.S." practically implemented in the context of five key stages, includes seven blocks in which the assessment is formed (D-accessibility, I-innovation, K-climate, O-objects, T-technologies, A-administration) allows due to the proposed indicators and assessment scales to determine the degree of readiness for digital transformations as various subjects that represent the agricultural business (in this case, this becomes possible due to expert scoring and assessment obtained during self-diagnosis), and makes it possible to form a unique digital profile of the region, with the establishment of an appropriate typological groups: advanced, medium, inert, critically low as part of the development of tools for the digital model of the economy.

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