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Convergent approach to the formation of regional agricultural ecosystem

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Subject. Functional and structural changes in the management system of economic processes are required to improve the efficiency of economic entities, to balance supply and demand, to promote sustainable development of the entire agri-food complex, and to ensure socio-economic balance of regional changes in the design and implementation of the development strategy. These changes are based on up-to-date management technologies and development tools.

Objectives. To develop theoretical, methodological, and conceptual aspects of sustainable growth management and balanced development of the agro-industrial complex and rural area ecosystem under the conditions of social and economic transformation, as well as to develop a mechanism for a unified platform of ecosystem elements in order to achieve its efficiency and financial sustainability. The mechanism is based on the methods of analysis, evaluation, and modelling.

Methodology. While preparing this article and conducting the study, the authors used the following general scientific methods and their corresponding techniques: abstraction, generalisation, analogy, dialectical method, and etc. The system approach was used to formulate conclusions and generalise the results of the study. The research methods are based on the theoretical provisions of regional and spatial economics, as well as strategic management. The key feature of the research methodology is the approach that determines the formation and implementation of the strategy of socio-economic development of the agro-industrial complex and rural areas in stages. It is a step-by-step process, which allows for timely adjustment of strategic actions. The methodological framework is formed on the principles of complex development analysis using a set of theories, standard techniques and methods (dialectical, causal, and statistical data processing), calculation of integral indicators, and expert assessments, etc.

Conclusions. Sustainable development of agro-economic systems and rural areas is largely determined by the need to substantiate absolutely new organisational-and-management and organisational-and-economic solutions for the localisation of factors of food security and food independence, climatic and social changes, state agrarian policy, forms of support for the agrarian industry, and international status. The authors contributed to the theoretical and methodological approach to the ecosystem development by considering these systems in the context of the evolutionary development of technological paradigms of forms of economic activity as models of the highest production efficiency of the synergy of object, structural, process, and innovation components.

Key words: convergent approach, agricultural ecosystem, agricultural ecosystem management model, agro-industrial complex, economic entity.

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Introduction

Under the conditions of economic sanctions, there is a need to identify new active trends in the transformation of the content and forms of socio-economic development of Russia as a whole, as well as individual economic entities. Managers at all levels and in different sectors of the economy must learn to use integrated production methods and have the ability to promptly digitalise organisational-and-management and organisational-and-economic decisions. In this regard, the study of the degree of influence of the external environment (taking into account its dynamics) on development of economic systems is the most important aspect of the elaboration of strategies for their development, the formation of the apparatus for assessing the performance of economic sectors (Roco & Bainbridge, 2003; Krasilnikova, 2016). Economic entities adapt to new conditions by improving the internal parameters of management systems (objectives, organisational structure, resource equipment, and personnel, etc.), since the high dynamism of the external environment implies faster changes in the ratio of its factors, which become unique (Jankovic et al., 2017).

Many modern economists state that in order to ensure sustainable growth and balanced development, the formation of economic systems acquires new convergent features due to the transition to new tools for organisational and economic development of balanced management effects.

It is relevant to search for such approaches to the study of adaptive changes in the agricultural business. On the one hand, these approaches would allow us to predict the direction of the changes more accurately. On the other hand, they would help to ensure the sustainability of the agricultural socio-economic systems (Kuzicheva et al., 2022).

Based on the above, the issues of maximising production levels, introducing flexible production systems by promoting digital transformation in organisations, automating high-tech processes, ensuring optimal productivity of production processes, effective implementation of government financial support for national projects, and highly effective results are beginning to play a crucial role (Bykov, 2020; Syomin et al., 2023; Titova, 2021; Truba & Truba, 2022).

The analysis of studies on sustainable and balanced development of agro-economic systems and rural areas indicates the need, first of all, for further clarification, systematic review of the forms, functions, and principles of the methods for implementing the organisational-and-economic mechanism for managing the sustainability and balance of large economic systems (such as the agro-industrial complex and rural areas) (Hein, 2018).

The state objectives of ensuring the food and economic independence of Russia and the desire of agricultural producers to increase profitability to ensure sustainable economic growth and balanced development determine the need to revise the existing interaction of economic systems of the agro-industrial complex and rural areas using the convergent approach (Bukhtiyarova et al., 2023).

Thus, considering the current practices of organisation and management of efficiency, resource availability, and quality of managerial decisions, there is a need for a more in-depth study of:

– the features and prospects of socio-economic development of the country, improvement of organisational forms and management decisions that ensure the achievement of national strategic goals and objectives;

– options for optimising organisational, economic, and social development in the context of new challenges and opportunities of the digital economy in accordance with the Strategy for the Development of the Agro-industrial and Fishery Complexes of Russia for the Period up to 2030 (Krasilnikova, 2016).

The scientific novelty of the research is determined by the theoretical and methodological provisions for optimising the organisational-and-management form of the agro-industrial complex and rural areas in accordance with the strategic development vectors up to 2030 and the conditions for the formation of the digital economy.

Research materials and methods

Like any modern systems, the agro-industrial complex and rural areas have a specific nature: on the one hand, they represent a closed organisational-and-management form with its own structure; on the other hand, these systems can be defined as open due to their internal capabilities and interaction with the external environment. With the development of society, due to the formation of non-market relations of organisations, public institutions and social production management, the agro-industrial complex and rural areas are transformed into a sectoral economic ecosystem. It has a

main distinctive feature characteristic of the environment of formation of interrelations of economic entities (Hein, 2018).

The economic ecosystem of the agro-industrial complex of Russia and rural areas, including many structural agents, functions with an active synergistic effect. It is associated with the creative use of all forms of capital during the formation of digital and information capital economy (Dudina & Lobanov, 2023).

The authors apply the economic ecosystem approach to the agricultural industry in the interests of economic entities. The approach contributes to ensuring the positive synergistic effect of the functioning of the agro-industrial complex of Russia and rural areas as a whole.

It is reasonable to consider the agricultural ecosystem as a set of principles (Fig. 1). It makes it possible to achieve the efficiency of each participant of the ecosystem, provides the growth of competitiveness of the real sector of the economy, and ensures the economic security of the country.

The structural elements of the organisational-and-management form of the ecosystem modify the general design of its construction, the goal-setting of the interaction between economic entities (the need to generate individual profit transforms into the need to obtain synergistic income; the competition between economic

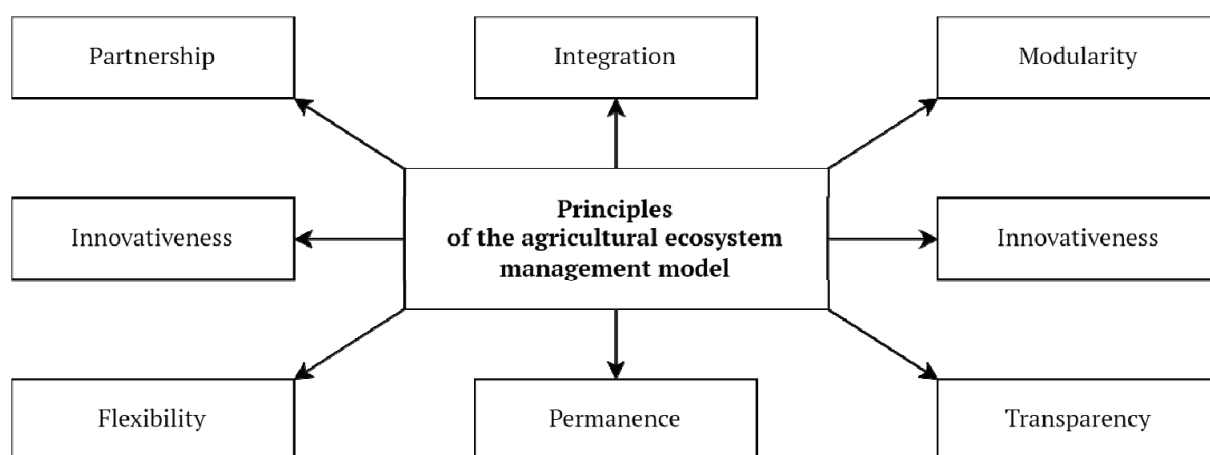


Fig. 1. Principles of the functioning of the agricultural ecosystem management model (Kolonchin & Sturova, 2022)

entities transforms into mutually beneficial cooperation aimed at synergistic income with a proportional, fair, and sufficient share of profit for each entity). As a result, the synergistic added value of economic entities formed by the established non-linear relationships should be determined when transforming the interaction between the structural agents of the economic ecosystem and the internal conditions of each of them (Dudina & Lobanov, 2023).

The characteristics of the principles on which the agricultural ecosystem management model is built are shown in Table.

Using this agricultural ecosystem model, the processes within each functional unit can be managed effectively (Klimuk, 2021). At the same time, the need to improve the tools of strategic planning and forecasting of socio-economic development management at various hierarchical

levels is caused by a set of interrelated factors:

- development of methodologies and research of individual issues of strategic planning and forecasting of development management in new conditions; development of tools for determining the prospects of socio-economic systems; solving the issue of organising systemic strategic management of socio-economic processes; ensuring balanced socio-economic development; searching for mechanisms of strategy implementation;

- incorporation of the accumulated experience of strategic planning and forecasting into management practices predetermines the need to develop new management mechanisms and tools for the continuity of socio-economic policy, making recommendations on the future socio-economic development of economic entities of the agricultural economy and rural areas;

Table

Characteristics of the principles of building an agricultural ecosystem (Klimuk, 2021)

Principle	Description
Partnership	Optimal functional distribution of tasks between the ecosystem participants, mutual assistance in solving the tasks, and joint responsibility for the results
Integration	Pooling the resources of participants to increase the joint capacity of the ecosystem
Modularity	Implementation of processes in the form of separate functional models that can be easily adapted to changing market and customer conditions
Innovativeness	Creative and novel approaches in solving the tasks of the ecosystem, taking into account the level of novelty, scientific, and practical significance
Flexibility	Adaptation of tools for generating innovations, interaction between ecosystem participants and customers, and measures to stimulate ecosystem activity in response to changing market, geopolitical, technical, technological, and other conditions in the external and internal environment
Permanence	A constant ongoing search for vectors of advancement of the ecosystem's activities based on the generation of solutions, optimisation of resources for the implementation of the ecosystem's constituent processes, and introduction of original solutions
Variability	Generation of the main (basic) and auxiliary (alternative) options for solving the set tasks, providing the opportunity to develop several models and scenarios in order to achieve the final result of the system development
Transparency	Involvement of interested, motivated participants in the ecosystem (developers, intermediaries, managers, suppliers, and users) to consider options for solving the tasks from different perspectives and improving the system for providing agricultural products, works, and services

– the practice of developing strategies to ensure balanced sustainable development in a dynamic external environment;

– a variety of different objects of strategic forecasting determines the diversity of strategies in terms of their composition, formation processes, functions, and results;

– high relevance of the study and application of various scientific approaches to assessing the feasibility of the strategies, as well as assessing their quality in terms of the implementation of organisational and managerial functions (Antipin & Ivanova, 2021).

Sectoral convergence in agriculture is considered as the most important factor of its effective development. But it seems relevant to develop and substantiate scientific, methodological, and practical recommendations for its implementation, taking into account the current state of the agro-industrial complex branches and their specifics (Dementieva, 2021).

The development of theoretical and methodological framework should be based on the practical experience of adaptation of the agricultural sector of the economy to new economic conditions. This concept allows us to consider the ecosystem as a sustainable model of activity based on a network of actors with different decision-making principles under the conditions

of autonomy and interconnectedness based on symbiosis (Dudareva, 2021).

Theoretical provisions on the evolution of views on the essence of modern economic systems and rural areas allow a deeper assessment of the nature of the proposed changes in economic theory, when each concept contains the structure of subsequent evidence and has the distinctive features of sustainable development (Wareham et al., 2014; Syomin et al., 2023).

Results

The sectoral economic ecosystem as a form of organisational and management system has its own economic architecture. It is a system of mutually determinable and fundamental principles of organisation and management. The principles are embodied in a set of components integrated by the internal environment of the organisation and its relationship with the external environment of economic development. The new ecosystem architecture is characterised by reforming the structural lattices of economic, organisational, and management mechanisms that comprise it. According to researchers, the following structural lattices exist: for the economic, business, institutional, and organisational and management mechanisms (Fig. 2) (Krasilnikova, 2016).

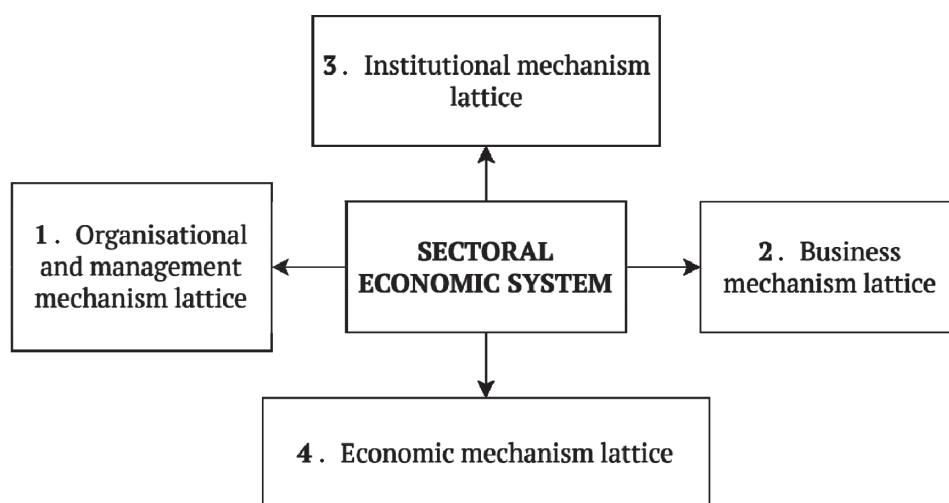


Fig. 2. The structural lattice architecture of the business mechanism of an economic ecosystem [compiled by the authors]

The elements of the structural lattices are interconnected by direct and indirect relationships, direct and indirect (logical) subordination. Thus, an architectural structure of interconnections is formed, an architectural object emerges, shaping the structural lattices. All four components of the architectural structure of the distribution of the structural lattices are integrated and interconnected by inter-subject relationships. Some of these relationships apply to lattices 2 and 3, but there are some that involve the entire structure, such as resources or human resources.

Economic entities adapt to new conditions by improving the internal parameters of management systems (objectives, organisational structure, resource equipment, and personnel, etc.), since the high dynamism of the external environment implies acceleration of changes in the ratio of its factors, which become unique (Dudareva, 2021; Krasilnikova, 2016).

The study of the degree of influence of the external environment, its dynamics and instability on the system development processes

is the most important aspect of the design of their development strategies and the formation of the efficiency assessment apparatus. It is relevant to search for such approaches to the study of adaptive changes in the agricultural sector. On the one hand, these approaches would allow us to predict the direction of the changes more accurately. On the other hand, they would help to ensure the sustainability of the functioning of agricultural socio-economic systems (Krasilnikova, 2016).

The agricultural ecosystem management model includes a number of consecutive stages, typical for each participant of the system and for the operating organisation as a whole (Fig. 3).

The basic set of mandatory elements, scale, structural differentiation, flexibility, and other parameters of the agricultural ecosystem management model can be presented schematically (Fig. 4).

These elements of the agricultural ecosystem provide effective interaction of participants in different industries according to the principles of vertical and horizontal integration. It helps to

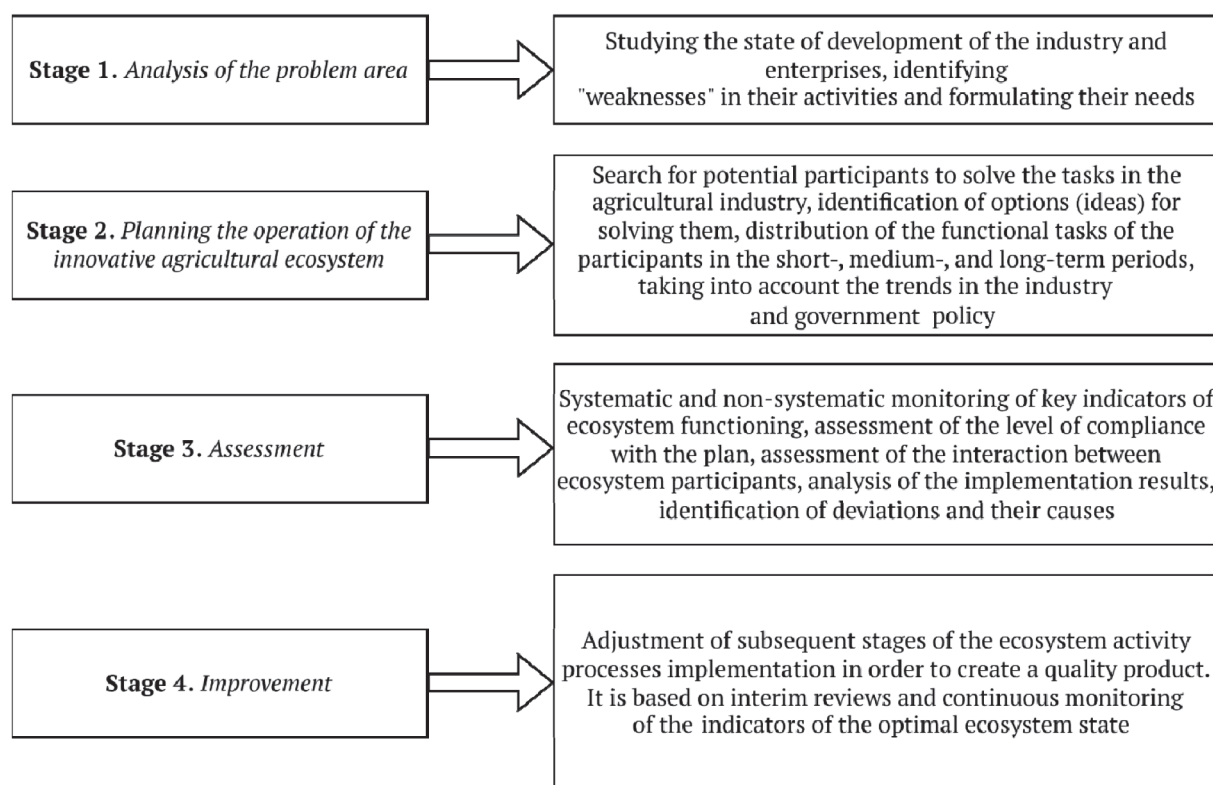


Fig. 3. Algorithm of the agricultural ecosystem management model [compiled by the authors]

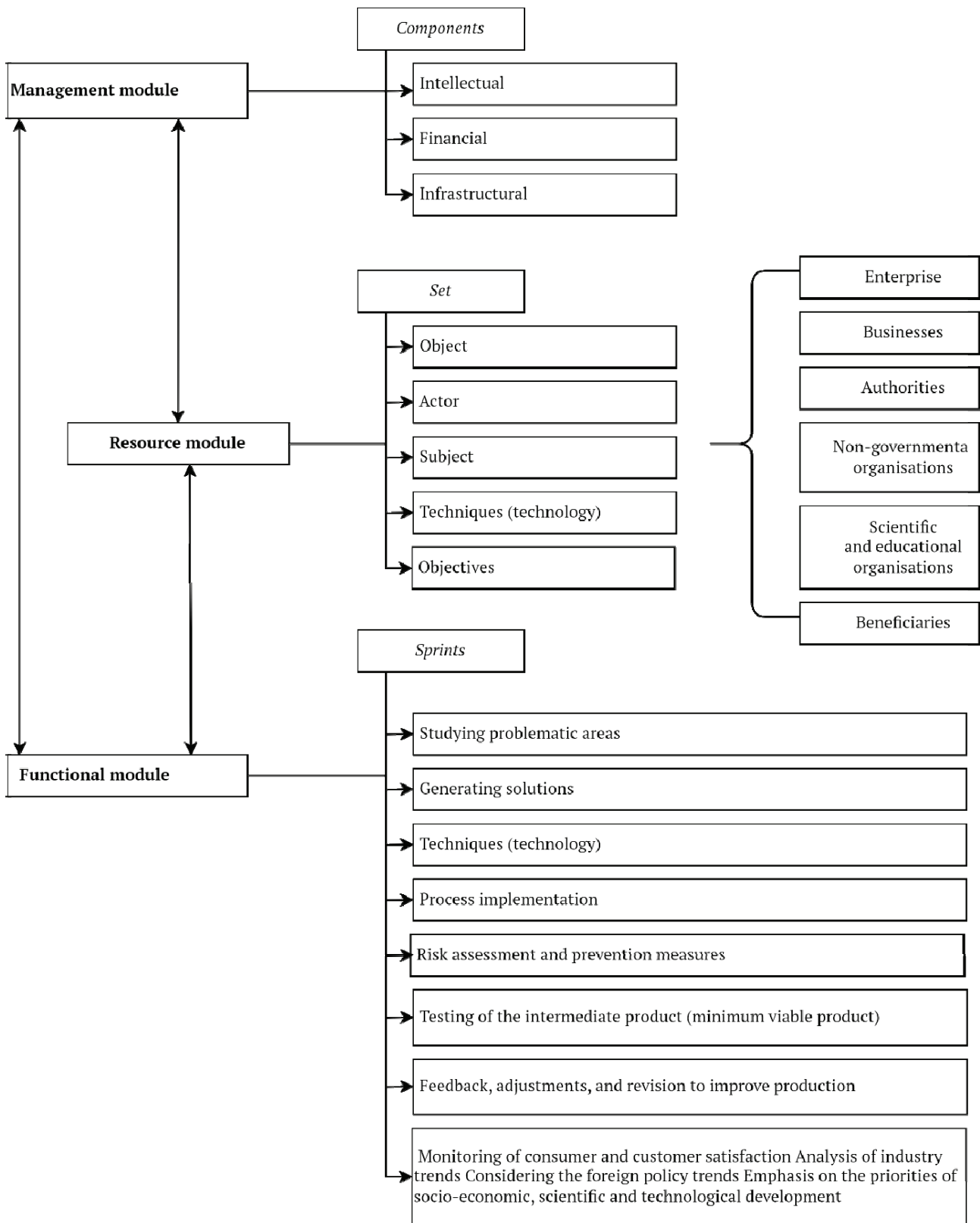


Fig. 4. Agricultural ecosystem management model
(Klimuk, 2021; Kuzicheva et al., 2022)

optimise costs for each process of implementing functions, to make adjustments, and to ensure a synergistic effect (Klimuk, 2021).

A combination of different types of activities contribute to a unique creative environment for the work of employees. It results in a positive synergistic effect from their joint work in a particular industry (Dudina & Lobanov, 2023).

The advantages and resource capabilities of each of the participants of the agricultural ecosystem are best manifested in the formation of ecosystem components (intellectual, financial, and infrastructural) (Fig. 5).

The authors believe that the mechanism of strategic planning is a priority tool for production and sales. The mechanism provides for the transformation of the agro-industrial complex and rural areas through the implementation of programmes, plans, and measures, which are interrelated over time and in space and involve the formation of internal tools to stimulate self-development in the intended areas (Truba & Truba, 2022).

The functioning of the organisational and economic mechanism for managing the

development of the agro-industrial complex and rural areas is always associated with institutional opportunities and constraints formed within its organisational framework (the issues of transforming property relations, distributing the created added value, and preserving the ecological balance between production and the environment). The economic framework of the organisational and economic mechanism of development management is aimed at increasing the economic efficiency of production in organisations of all forms of ownership (Tishchenko, 2021).

Results and discussion

Transformation in the conditions of a digital economic organisation implies qualitative and structural changes in all structural lattices of the economic mechanism. In general, the architecture of the economic system is changing into a sectoral economic ecosystem. It can be regarded as a qualitatively new organisational and management form of business. It takes into account the changes in the conceptual foundations of the development of the institutional environment in the conditions

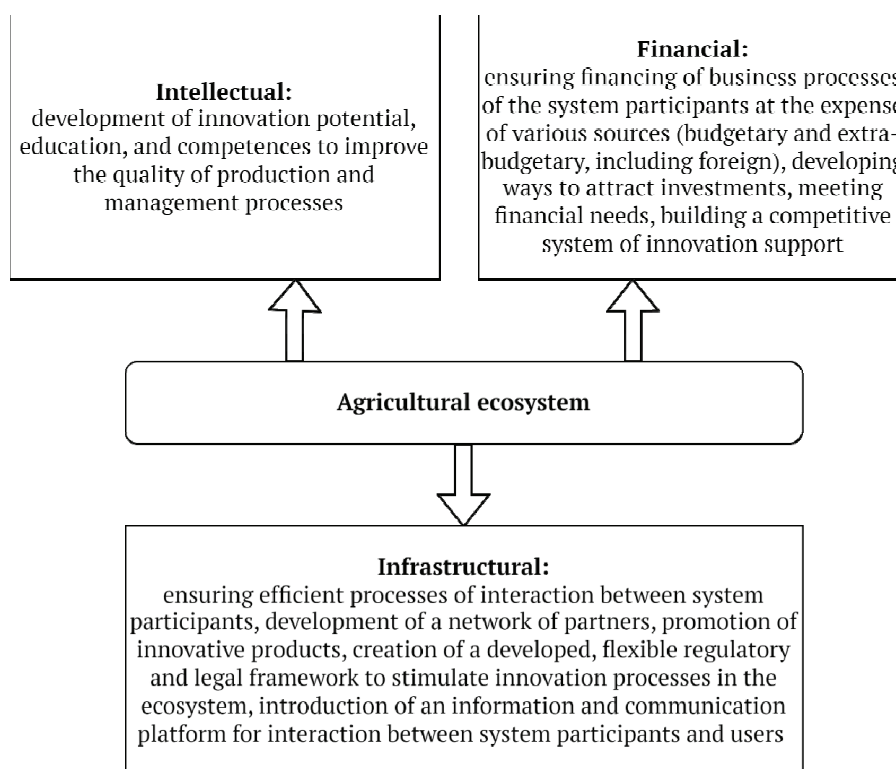


Fig. 5. The main structural elements of the agricultural ecosystem (Bukhtiyarova et al., 2023; Klimuk, 2021)

of deepening socio-economic relations between the entities at all stages, which are functioning and developing in a single economic space under increasing competition (Kuzicheva et al., 2022; Tishchenko, 2021; Truba & Truba, 2022). Therefore, the trend for sustainable growth and balanced development is a promising tool for the implementation of innovative solutions in agro-economic systems. In rural areas, it promotes a qualitative changes in infrastructure and enhances the motivation of the population for agricultural activities in various organisational and legal forms (Kuzicheva et al., 2022).

The ecosystem approach defines the whole life cycle of the development process, based on the ability to develop scenario cycles in the face of environmental challenges, development needs and values (Dudareva, 2021).

The convergent concept for the promotion of the trends of sustainable growth and balanced ecosystem development is to systematise scientific achievements, theories, and models of institutional weighting. It leads to the emergence of successive research traditions of simultaneous convergence and targeted trends of sustainable growth and balanced development, ecosystem approach, ecology, industry 5.0, and digital development. The digital and information economy directly influences the structure of the organisational and management form of transformation of Russia's agro-industrial complex and rural areas, reflecting the hierarchy of its levels. Thus, "sectoral convergence of agriculture is a process of convergence of the development of the agro-industrial complex systems through the use of innovative technologies, common managerial, biological, technological, economic, and organisational factors to level the profitability of industries to increase the efficiency of all types" (Dementieva, 2021). The process of step-by-step construction of a sectoral agricultural economic ecosystem within the digital economy is an information environment for decision-making in the format of a single production and economic complex. It implies expanded reproduction of resources, production and distribution of products

in accordance with the requirements of food security and demand of the population (Roco & Bainbridge, 2003; Dudina & Lobanov, 2023; Kolonchin, 2019).

The new developing organisational structure for managing economic relations and interconnections of economic entities of the Russian agro-industrial complex differs from the traditional production system. It includes a digital transformation of substantiating the directions of the production systems development, ensuring the optimal level of production, and the ability to forecast the development of production and sales (Kuzicheva et al., 2022).

Thus, the integral system of digital transformation of the economy provides the foundation for the concept of innovative approaches and mechanisms for forecasting socio-economic development of individual branches of the agro-industrial complex, the state as a whole, and rural areas.

It should be stated that the improvement of ecosystem management under the conditions of active technical and economic, organisational and managerial transformations is a promising direction for the formation of an institutional environment with its effective intra-industry and inter-industry integration and production specialisation (Ghisellini et al., 2016; Kuzicheva et al., 2022).

Factor analysis of the methodology of the formation of sectoral convergence in the agro-industrial complex allowed to define the principles (purposefulness, consistency, scientific character, efficiency, optimality, adaptability, consistency of interests, and social orientation), functions (economic, environmental, and social), and indicators (comparative assessment of efficiency, level of profitability and cost-effectiveness of production, number of employees, and production and sales costs) of its implementation.

Conclusions

The ecosystem approach is an important tool for enhancing sustainable growth and balanced development, as it provides the highest efficiency

compared to traditional economies, closed systems, and platform models. The dominant principles and parameters make it possible to increase the intra- and inter-sectoral interaction in the management system of ecosystem development and determine the strategic directions of transformation of the institutional environment. Unfortunately, there is currently no research on the architecture of the economic ecosystem. The issues of consistency of views on the model of external and internal environment as a driver of digital transformation have not been resolved. There is no unified conceptual approach to the introduction of innovative mechanisms for the development of economic systems. The principles of building and developing the digital transformation of the economy and the activities of enterprises in the digital environment have not been structured. There is no relevant algorithm for selecting

the necessary specific analysis and forecasting methods and techniques, as well as modelling of activities. The ecosystem approach can be used to significantly improve the performance of each of the interacting actors in the system with a synergistic effect.

Therefore, the above challenges in scientific research and practical activities allow us to talk about the theoretical and practical interest in building the concept of ecosystem approach based on digital transformation of the economy, the design of new scientific approaches to the development transformation along the trajectories of agro-economic and territorial systems.

Conflict of Interest

The authors declare the absence of obvious and potential conflicts of interest related to the publication of this article.

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Конвергентный подход к формированию региональной экосистемы аграрного типа

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Предмет. Для повышения эффективности деятельности хозяйствующих субъектов, баланса предложения и спроса, устойчивого развития всего агропродовольственного комплекса и обеспечения социально-экономической сбалансированности региональных изменений при разработке и реализации стратегии развития в первую очередь необходимы функциональные и структурные изменения системы управления экономическими процессами на основе обновленных управленческих технологий и инструменты развития.

Цели. Осуществление разработки теоретических, методологических и концептуальных положений управления устойчивым ростом и сбалансированным развитием экосистемы АПК и сельских территорий в условиях социально-экономических трансформаций, а также формирование механизма единой платформы элементов экосистемы в целях достижения ее эффективности и финансовой устойчивости на основе дополнения методов анализа, оценки и моделирования.

Методология. В процессе подготовки данной статьи и проведения настоящего исследования авторами были использованы следующие общенаучные методы и соответствующие им приемы: абстрагирование, обобщение, аналогия, диалектический метод и др. Для формулирования выводов и обобщения результатов исследования применялся системный подход. Методы исследования основываются на теоретических положениях региональной и пространственной экономики, стратегического менеджмента. Ключевой особенностью методологии исследования является подход, определяющий формирование и реализацию стратегии социально-экономического развития АПК и сельских территорий поэтапно (пошаговый процесс, что позволяет своевременно скорректировать стратегические действия). Методологическая база сформирована на принципах комплексного анализа развития с использованием совокупности теорий, типовых методик и методов (диалектического, причинно-следственного, обработки статистических данных), расчета интегральных показателей, экспертных оценок и т. д.

Выводы. Устойчивое развитие агроэкономических систем и сельских территорий в значительной степени определяют необходимость обоснования абсолютно новых организационно-управленческих и организационно-экономических решений в части локализации факторов обеспечения продовольственной безопасности и продовольственной независимости, климатических, социальных изменений, государственной аграрной политики и формы поддержки

аграрной отрасли, международного положения. Дополнение авторов в части теоретико-методологического подхода к развитию экосистем заключается в рассмотрении данных систем в условиях эволюционного развития технологических парадигм форм экономической деятельности в качестве моделей исключительно с наивысшей производственной эффективностью синергетического взаимодействия объектных, структурных, процессных и инновационных составляющих.

Ключевые слова: конвергентный подход, экосистема аграрного типа, модель управления экосистемой аграрного типа, АПК, хозяйствующий субъект.

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