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SYNERGETIC INTERACTION OF THE BIOECONOMICS PRINCIPLES IN THE GLOBAL ECONOMIC SYSTEM STRUCTURE**СИНЕРГЕТИЧНА ВЗАЄМОДІЯ ПРИНЦИПІВ БІОЕКОНОМІКИ У СТРУКТУРІ ГЛОБАЛЬНОЇ ГОСПОДАРСЬКОЇ СИСТЕМИ**

Urgency of the research is to take into account the principles of bioeconomy in integrating economic systems into the world economy with the focus on providing conditions for minimizing various risks.

Target setting. Determination of the bioeconomy principles in synergistic interaction, which will reveal their socio-economic beneficial effect for the development of the world economy.

Actual scientific researches and issues analysis. Solving the issues of economy formation and development both in the world and in Ukraine.

Uninvestigated parts of general matters defining. Studying synergistic interaction new forms and methods of bioeconomic processes and their integration into the global economic system.

The research objective. Studying the synergistic interaction basic principles of bioeconomy from the point of effective socio-economic development.

The statement of basic materials. Bioeconomy is considered as an economic mechanism for the biotechnology implementation. The value of this approach is to take into account the triple combination of the sustainable development principles: economic, social, biological, based on four fundamental foundations: gene technology and industry engineering; resource-restoration production; research-scientific integration; practical bioclast orientation.

Conclusions. The bioeconomy basic principles fulfillment will make it possible to reorient the global management system to a new high-quality level, on which basis strategy of socially-oriented and safe development of the economic system will be based.

Keywords: bioeconomics; biotechnology; bioeconomic processes; bioresources; synergistic interaction.

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Urgency of the research. At the present stage of development, the world market is characterized by general transformations that determine the parameters of the global socio-economic world order and are conditioned by significant technological achievements of mankind. The key role of the technological factor in the process of economic growth is realized through a system of relevant world technological priorities that contribute to structural changes in the economy.

In such conditions, the issue of further dynamic technological development and the integration of all economic systems into the world economy and increase of its productivity is not the only priority and urgent issue, but also providing the world community with the conditions for minimizing economic, technological, social, political, environmental and other types of risks remains the priority and urgent issue. That is, we are talking about the security of the global economic system, which is based on the bioeconomy principles.

Target setting. Since adherence to the basic bioeconomics principles for ensuring a stable and dynamic development of the world economy, oriented not only on the demands of modern society, but

Актуальність теми дослідження полягає у врахуванні принципів біоекономіки при інтеграції економічних систем у світове господарство з орієнтацією на забезпечення умов для мінімізації різних ризиків.

Постановка проблеми. Визначення принципів біоекономіки у синергетичній взаємодії, яке дозволить виявити їх суспільно-економічний корисний ефект для розвитку світового господарства.

Аналіз останніх досліджень і публікацій. Розв'язання питань становлення та розвитку біоекономіки як в світі, так і в Україні.

Виділення недосліджених частин загальної проблеми. Вивчення нових форм і методів синергетичної взаємодії біоекономічних процесів та інтеграції їх у світову господарську систему.

Постановка завдання. Дослідження основних принципів синергетичної взаємодії біоекономіки з позиції ефективного суспільно-економічного розвитку.

Виклад основного матеріалу. Біоекономіка розглядається як економічний механізм реалізації біотехнологій. Цінність такого підходу полягає у врахуванні триєдиного поєднання принципів сталого розвитку: економічного, соціального, біологічного, в основі яких лежать чотири фундаментальні основи: генна технологія та галузева інженерія; ресурсно-відновлювальне виробництво; дослідницько-наукова інтеграція; практична біокластерна орієнтація.

Висновки. Дотримання основних принципів біоекономіки дасть змогу переорієнтувати світову систему господарювання на новий якісний рівень в основі якого знаходиться стратегія суспільно орієнтованого та безпечного розвитку економічної системи.

Ключові слова: біоекономіка; біотехнології; біоекономічні процеси; біоресурси; синергетична взаємодія.

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also future generations, underlies the effective functioning of the global economic system, it is important to study certain principles in synergetic interaction thoroughly, which will allow to reveal fully their socio-economic useful effect.

Actual scientific researches and issues analysis. Investigating the question of the formation and development of bioeconomics both in the world in general and in Ukraine in particular, it should be noted that leading domestic and foreign scientists are considering certain aspects of this topic. Bioeconomy as an object of regulatory influence was studied by foreign scientists such as H. Henriquez-Cabot and R. Martinez, who first proposed the term "economics of biological origin". Also in the scientific world the works by P. Verburg, R. Kellogg, K. Patermann, S. Richardson, A. Sheppard, etc. are well-known. The works by F. Mantino, D. Viaggi, and others [1] are devoted to the problems of the transition to bioeconomics.

Thus, among domestic scientists we can single out the works by M. P. Talavyra [2], O. V. Shubravskaya [3], I. V. Dul'ska [4], who studied bioeconomics as one of the foundations of sustainable development of society, and also determined the features of the formation and development of bioeconomics in Ukraine. In his works, V. V. Baidala proposes the formation of a system of indicators for assessing the level of development of bioeconomics in Ukraine and determines the macroeconomic factors of its development [5]. S. D. Melnychuk, V. V. Zhebka, O. D. Baranovska, V. V. Vashchenko examine and study strategies for the development of bioresources on a bioeconomic basis [6]. The question of the organizational and economic mechanism for the implementation of bioeconomics was covered by V. I. Hlazko, considering the current directions of the "green economy" and the need to include the natural environment in the system of socio-economic relations and the infrastructure of bioeconomics [7]. V. I. Liashenko investigated the features of regulation and development of economic systems and determined the place of bioeconomics in them [8].

Uninvestigated parts of general matters defining. Despite a significant amount of works in this direction, the issue of development and synergetic interaction of bio-economic processes and their integration into the world economic system, in our opinion, is still open, as the world market is in constant development and requires new forms and methods of introducing modern efficient and safe management system.

The research objective. Studying the synergistic interaction basic principles of bioeconomy from the point of effective socio-economic development, the concretization of their synergetic interaction and the features of their integration into the global economic system under conditions of global transformation.

The statement of basic materials. In accordance with the general world trend, more and more business entities prefer to use renewable resources for the development of new types of products and processes, which in turn contributes to the formation and dynamic development of a new form of management - bioeconomy. This form has significant socio-economic benefits, which can be attributed to increasing food security for the world population, increasing the number of available sources of renewable and alternative energy, and reducing and preventing the effects of global climate change.

In spite of this, the principles and concepts of bioeconomics for the world economy and humanity are not new, but, given the current trends in the market, its rapid technological development, accompanied by increased risks and problems associated with the deterioration of the environmental situation, leading to devastating consequences and changes in climatic zones, acquires new content. Often, bioeconomics is seen as an economic mechanism for the implementation of biotechnology, that is, as a new branch of the existing technological structure.

Based on the analysis of well-known scientists and practitioners' interpretations, we formulate our vision for defining the essence of the category: bioeconomics is an economy based on the systematic use of biotechnologies in the production, distribution, exchange and consumption of biological resources, with a focus on maintaining the principles of restability and safety, directed to meet public, industrial and economic needs.

The value of a bioeconomic approach is to take into account the triune combination of sustainable development principles:

✓ economic – involves the optimal use of limited resources and the use of environmental, energy and material-saving technologies, including the extraction and processing of raw materials, the creation of environmentally acceptable products, minimization, processing and disposal of waste;

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✓ social – is aimed at maintaining the stability of social and cultural systems, including the reduction of the number of destructive conflicts between people and the equitable distribution of benefits;

✓ ecological – is ensured by the integrity of biological and physical natural ecosystems, on which the global possibility of self-healing and dynamic adaptation to changes depends.

The purpose of this development is to meet the needs of modern society, with an orientation towards the ability of future generations to meet their needs.

By expanding and globalizing the bioeconomy, additional opportunities can be found for solving global problems, such as limiting food resources, reducing primary non-renewable energy resources, environmental safety and improving the life quality.

Having analyzed the approaches to the definition and proper interpretation of leading scientists, we can conclude that the bioeconomy basis principles are four fundamental foundations: gene technology and branch engineering; resource-restoration production; research-scientific integration; practical bioclast orientation.

Let us dwell on the biocluster orientation. A biocluster is a network of interconnected agro-industrial enterprises that are created to provide a complete cycle of processing of raw materials and waste products, and therefore the purpose of biocluster orientation is to build around the main agrocompany of such a network of production and processing enterprises that use waste products and their by-products, which would allow to develop transport, logistics and social infrastructure at a high innovation and technological level, thus ensuring an effective socio-economic development both a region and the country in general, without violating the biobalans and following the biosafety principles.

World business practice is oriented on the high level of such bioclusters implementation, since in the future such system will significantly increase the profitability of farm complex. However, the obstacle to the effective implementation of the global multi-level policy in this direction is the high cost and long payback period of such biotechnological production.

Implementation of an effective bioeconomic strategy is possible only in the conditions of synergistic interaction of the three process components: government, society, business entities (Fig. 1).

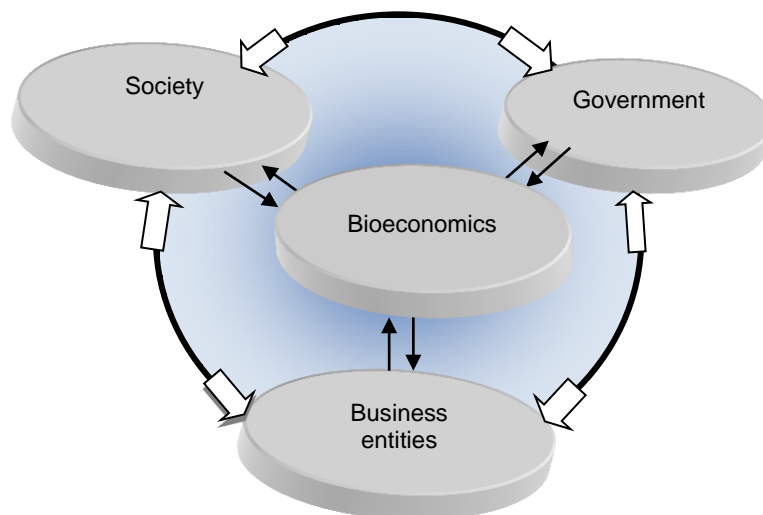


Fig. 1. Model of effective synergistic interaction [6]

The role of the government in this model is ensured by the introduction and support of national bioeconomy development programs, research and projects in a particular direction, the innovation system formation, and the promotion of a systematic plan implementation of the investment policy for the rapid and effective bio-industry development.

In the given model, business entities in order to ensure its effective functioning, require a reorientation to the generally accepted norms and standards of biotechnological production. Of course, changing the vector of economic activity from traditional methods of inefficient, resource-intensive and mul-

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tiwaste production to modern one, with the use of renewable resources, sources expansion of alternative energy and environmentally safe, non-waste, requires the attraction of capital and additional investments. Therefore, close interaction with the government is at the heart of such a reorientation. The beneficial effect of such interaction will solve the global problems associated with the limited availability of food raw materials, mineral resources, and environmental pollution. At the same time, the actors involved in biomedicine and healthcare with the support of the government are able not only to solve problems related to diagnosis, prevention and treatment of the population, but also to significantly improve the quality of the society life, but also to take leading competitive positions in the market.

Modern society is rather ambiguous in responding to the bioeconomy positive opportunities. Insufficient educational and informational training of the population makes it difficult to perceive innovative offers and benefits. Accordingly, there is a low readiness to use the broad perspectives and possibilities of solving problems related to quality and life expectancy for the mankind benefit. Broad promotional and informational activities both from the state side and from the side of economic entities, providing feedback and freedom of choice would help to neutralize negative trends and prepare society for the transition to a new biotechnological level of development.

Regardless of the approaches and peculiarities of the bioeconomics division into separate spheres, the issues of implementing the basic principles in each of them remain relevant and priority both at the global and local levels of the economic system. In addition, the implementation of such principles should be adapted in accordance with regulatory requirements for each individual level. In our opinion, it is necessary to single out the basic levels of such a system, to determine the features of development, regulation and determine the bioeconomics place in this structure (Tab. 1).

Table 1

Bioeconomy place in the basic levels of the global economic system and their characteristics

Economic system levels	Structure	Regimes and Development Modes	Functions
1	2	3	4
Meta-level (interstate relations)	World economy as a set of all interacting levels: branches, intersectoral, bioclusters, territorial complexes, individual farms	Military programs, international agreements and cooperation on general biosafety issues	Ensuring the global reproduction of humanity as a biological species.
Mega-level (integration associations)	Integration specialized territorial and regional alliances and associations covering farms of different groups of countries, multinational corporations.	International treaties, concepts of sustainable development, agreements in the field of bioeconomic development; regimes of mutual benefits and tariffs for the development of biogas; investment programs for biotechnology support	Efficient use of scarce resources, provision of conditions for their reproduction and search for solutions to reduce environmental impacts.
Macro-level (national interests)	Individual state economy	International treaties, state programs of sustainable social and economic development; national legislation; special customs and tax (preferential) regimes for biotech industries	Ensuring the conditions for population and resources reproduction; creating an attractive investment climate; ensuring the effective use of bioresources and biosafety
Meso-level (industrial-financial groups)	Regional, territorial, branch and inter-sectoral complexes and associations	Priority biotechnology development programs; special tax privileges	Corporate development of intersectoral community with an orientation on the bioresources moderate use and the biocluster formation
Micro-level (intra-industry interaction)	Enterprises and their associations that produce the final product	Priority biotechnology development programs; special tax privileges; the only strategy for biotechnology development	Provision and organization of biotechnological production with minimal impact on the environment to meet consumers' needs; alternative energy sources use

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1	2	3	4
Mini-level (individual groups interaction)	Entrepreneurs, public associations, workers professional associations	Special modes of business incubators; simplified driving regimes for small businesses; corporate social strategies; tactical programs of biotechnology development within the framework of the sectoral strategy	Provision of general production conditions for the enterprise and formation of environmentally safe working conditions
Nano-level (Individual interests)	Individuals, entrepreneurs, workers, whose activities are aimed at the creation and satisfaction of public goods	General and special tax regimes aimed at stimulating self-employment; workers motivation mode; training and advanced training	Providing the appropriate level of employment, forming a socially responsible worker

Source: created by the authors on the basis of [8, p. 49-51]

As we can see from the table, the implementation of the biosafety and bioeconomic development principles both for the global economic system and for individual economic structures will make it possible to bring the management system to a new quality level, based on the strategy of socially oriented and safe (including biological) development of the economic system.

To ensure such development by the 7th Framework Program (FP7), which brings together all industries related to biological objects of economic activity, the BECOTEP (Bio Economy Technology Platforms) project was proposed. The project is based on the principles of bioeconomics based on (Knowledge Based Bio Economy) knowledge. BECOTEP unites in its structure 9 European technology platforms: ETP «Global Animal Health»; ETP «Plants for the Future»; ETP «Food for Life»; ETP «Sustainable Chemistry»; ETP «Sustainable Farm Animal Breeding and Reproduction (FABRETP)»; ETP «Forest Based Sector»; ETP «Biofuels»; ETP «Agricultural Engineering»; ETP «Aquaculture and Innovation».

But the work of these platforms is only part of the bioeconomic development global policy aimed at developing new technologies and processes for the bioeconomy, the development of markets and increasing their competitiveness in the sectors of bio-economy by cooperating stakeholders. Such platforms will make it possible to identify priority directions for human development, their research and perspective development vectors within the specified time frame. As a result, the reorientation of financing, investment and research in the field of management, of global significance for the development of humanity and the maintenance of a high standard of living [10].

Conclusions. Under conditions of global transformation, effective implementation and adherence to the basic principles of bioeconomy to ensure a stable and dynamic bioeconomic development of the world economy, biosecurity for both the global economic system and individual economic structures, will allow to reorient the global system of management to a new level of quality. It will be based on the strategy of socially oriented and safe development of the bioeconomic system. Synergetic interaction between government, society and business entities will allow to implement an effective bioeconomic strategy and fully identify its socioeconomic beneficial effect at different levels of the economic system, identifying the priority directions for the development of humanity.

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