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STRATEGIC FUNDAMENTALS OF BIOECONOMY DEVELOPMENT IN UKRAINE

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ABSTRACT

The purpose of this study is to identify the global trends in bioeconomic development and to develop the Concept of a State Strategy of Bioeconomic Development in Ukraine for the period until 2030. The authors define the bioeconomy as a set of industries that ensure the sustainable use of renewable resources, the use of biotechnologies for production while reducing the potential environmental damage, contributing to the innovative development of relevant sectors, and providing positive aspects of socio-economic development. The article formulates approaches to measuring the state and effectiveness of the bioeconomic development in Ukraine and the EU countries. Based on the analysis of world experience, it is concluded that to accelerate the development of the bioeconomy in Ukraine, it is necessary to develop the Strategy for the development of the bioeconomy in Ukraine. The conceptual foundations of such a Strategy have been developed by the authors of the article. The results of the study are the basis for the development and implementation of the State Strategy for the Development of Bioeconomy in Ukraine. The relevance of this study is determined by the absence of the Bioeconomic Development Strategy in Ukraine, which makes it difficult for the country to reach a new technological and innovative level of development. At the same time, the development and implementation of this Strategy will help Ukraine enter the international system of production of new knowledge and technologies.

Key words: bioeconomy, concept of the state strategy for the development of bioeconomy, innovative development, biotechnology, bioenergy, bioproduction
JEL codes: O13, Q28, Q18

INTRODUCTION

Trying to combine economic growth with modern challenges, European and other countries of the world are creating new models of innovative development, one of which is the model of the bioeconomy. The transition from a modern economy based largely on the use of non-renewable resources to the bioeconomy is not possible only through market mechanisms, since the price of the commodities does not include the interests of future generations. Therefore, we consider it necessary to apply state

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regulation of bioeconomic development in Ukraine. The adoption of the State Strategy for the Development of Bioeconomy until 2030 will accelerate this process. The purpose of the study is to identify global trends in bioeconomy and develop the Concept of the state strategy for bioeconomy in Ukraine until 2030. The objectives of the study are to define the essence of the bioeconomy, to formulate approaches to measuring the state and efficiency of bioeconomy development in Ukraine and EU countries, to develop conceptual bases of the state Bioeconomy Development Strategy in Ukraine based on the analysis of bioeconomy development experience in EU countries, including Poland.

THEORETICAL BACKGROUND

The priority development of the bioeconomy has been declared by a large number of documents of the European Union. In particular, the updated Bioeconomy Strategy until 2030 identifies specific actions that should be based on the use of biotechnology in primary production, industry, and health care (OECD, 2018). The strategy outlines public policy scenarios aimed at developing the bioeconomy while delivering positive social, environmental, and economic outcomes. The update also responds to new European policy priorities, in particular the renewed Industrial Policy Strategy, the Circular Economy Action Plan, and the Communication on Accelerating Clean Energy Innovation, all of which highlight the importance of a sustainable, circular bioeconomy to achieve their objectives (European Commission, 2018). In particular, the bioeconomy strategy for Italy aims to provide a shared vision of the economic, social, and environmental opportunities and challenges associated with the creation of an Italian Bioeconomy based on longer, more sustainable, and locally routed value chains. It also represents a significant opportunity for Italy to enhance its competitiveness and role in promoting sustainable growth in Europe and the Mediterranean area (Implementation Action Plan (2020–2025) for the Italian Bioeconomy Strategy).

The conceptual foundations for the development of bioeconomy in a global context were investigated by Beluhova-Uzunova, Shishkova and Ivanova (2019). Policy initiatives of various OECD countries, which include supporting the development of the bioeconomy and implementing its results in the healthcare sector, have been studied by Borowiecki and Philp (2019). These scientists made a comparison of the indicated initiatives with an emphasis on public policy goals in specified areas, target groups, industry priorities, budget, time horizon, selection criteria, and international cooperation. Maciejczak (2018) notes that, through the use of renewable biological resources to meet social needs, the bioeconomy presents an alternative growth model that incorporates economic, environmental, social, and political goals, and states that bioeconomic policies do not yet respond to the quality of sustainable development, but being consistent with the Common Agricultural Policy can be changed in this direction.

Altoukhov, Kashkin and Utkina (2021) note even though a great contribution has already been made to the science of bioeconomy, much of it still refers to promising scientific developments in such areas as biology, biomedicine, engineering, artificial intelligence, technology, chemistry, etc. The results of their study point to the need for an in-depth analysis of the challenges and opportunities the world faces on the road to bioeconomy.

The bioeconomy is seen as a catalyst for systemic change, tackles the economic, social, and environmental aspects of the Green Deal, seeking new ways of producing and consuming resources while respecting our planetary boundaries and moving away from a linear economy based on extensive use of fossil and mineral resources (European Commission, 2020).

Despite the global interest in the bioeconomy, there are various challenges associated with the development and implementation of specific national, regional bioeconomy strategies that could ensure sustainable development. Ukraine, together with the world community, requires scientific substantiation, development, and implementation of the State Bioeconomy Development Strategy. This article is devoted to the study of the key principles of such a strategy.

MATERIALS AND METHODS

To execute the research tasks, the authors of this study used scientific literature review and methods of analysis and synthesis, namely the logical and constructive methods as well as induction and deduction analysis method. The concept of the state strategy for the development of the bioeconomy in Ukraine was developed based on an epistemological analysis of literature. The basic research method was the review of policy and scientific papers from the perspective of the proposed Concept of the state strategy for the development of bioeconomy. The conceptualization of the short and long-term state support strategies has been elaborated through the epistemological analysis of the literature. The research involved the analysis of the dynamics of phenomena, comparative analysis of indicators. In the theoretical part of the paper, source material from foreign literature devoted to the study of the bioeconomy phenomenon was used (more than 50 sources). The main source of information for our study was: data provided through official sources (World Bank, Eurostat, State Statistics Service of Ukraine, official European Union website), consultation with the experts of the field, similar studies conducted in this field. Having studied and analysed all these sources, the authors were able to form their approaches to creating the conceptual framework of the Strategy for the Development of the Bioeconomy in Ukraine, which is set out in this paper.

RESEARCH RESULTS AND DISCUSSION

The conducted studies have given grounds to consider the bioeconomy as a set of industries that ensure the sustainable use of renewable agricultural, water and forest resources, waste and organic by-products, relying on the use of biotechnology for biomass processing and the production of various products, while reducing the potential environmental damage, contributing to innovative development of new competitive opportunities in the relevant sectors and providing positive aspects of socio-economic development (Fig. 1).

According to the international expert community, the emerging bioeconomy will be influenced by state support for research and other regulatory measures, protection of intellectual property rights, and the attitude of society towards the bioeconomy. Intellectual property rights can increasingly be used to encourage

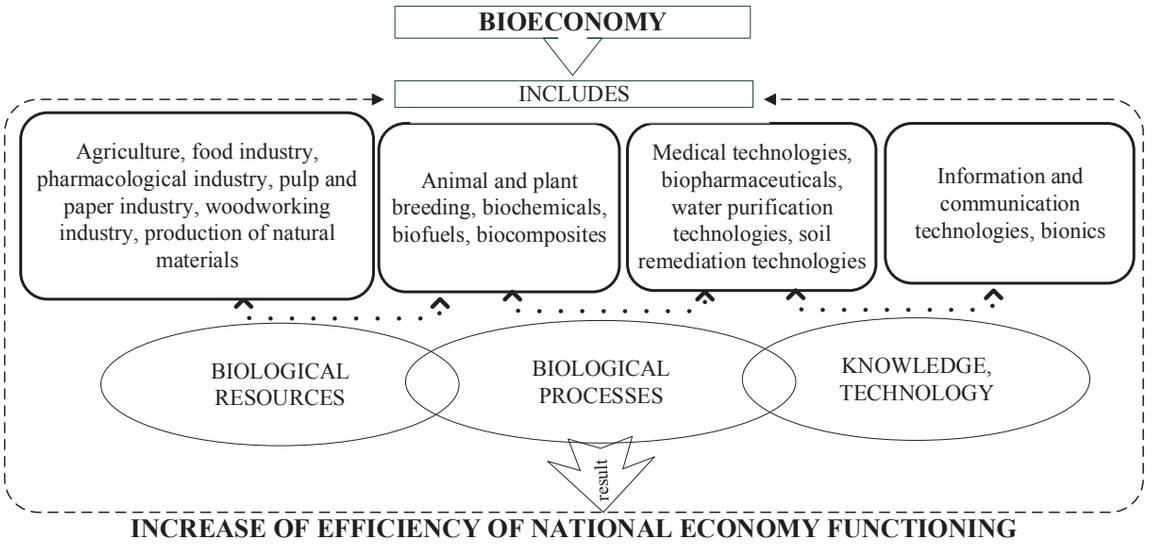

Figure 1. The logical-block diagram of bioeconomy

Source: own elaboration.

knowledge-sharing through collaborative mechanisms such as patent pools or research consortia. Societal attitudes towards biotechnologies will continue to affect market opportunities, but public opinion may change, for example, when biotechnology products provide significant benefits to consumers or the environment (OECD, 2009).

In this regard, an important aspect of scientific research is the formation of approaches to the assessment of the state and effectiveness of bioeconomic development. The state of the bioeconomy in a country can be estimated by the added value that it creates and employment in it. The share of the bioeconomy in total employment is also used as an indicator of the size of the bioeconomy. Based on the approaches proposed by Urmetzer and Pyka (2014) and Zalizko et al. (2018) the authors of the article conducted a comparative analysis of their empirical values in Ukraine, Poland, and Europe. The results are shown in Table 1.

The data in Table 1 allow us to understand how significant the share of bioeconomy is in the economy of Ukraine, as well as to conclude the prospects of the bioeconomy. As the agricultural sector in Ukraine occupies an important place, the bioeconomy has good preconditions for development. The cost indicators characterizing the size of the bioeconomy strongly depend on the interpretation of the bioeconomy used.

European institutions pay considerable attention to the development of both pan-European and national programs and strategies for the development of the bioeconomy (OECD, 2009). In Ukraine, similar

Table 1. Indicators of the bioeconomy value in 2018

Indicator	Ukraine	Poland	EU
Agriculture, forestry, and fishing, value added (% of GDP)	10.14	2.11	1.51
Agriculture, forestry, and fishing, value added (constant 2010 USD)	14.37	10.53	272.25
Forest area (% of total land area)	16.71	30.88	38.09
Arable land (% of land area)	56.58	35.29	24.88
Rural population (% of total population)	30.65	39.94	24.33
CO_2 emissions (metric tons per capita)	4.47	8.76	8.8
CO_2 emissions intensity (kg per 1 000 USD of GDP)	0.57	0.31	–
Energy use (kg of oil equivalent) per 1 000 USD of GDP (constant 2011 PPP)	298.14	98.4	86.58
Share of renewable energy in gross final energy consumption (%)	3.00	11.74	16.73
Renewable energy consumption (% of total final energy consumption)	4.50	11.28	17.98
Artificial fertilizer consumption (kg per ha of arable land)	52.75	172.82	158.38
Water productivity, total (constant 2010 USD of GDP per m^3 of total freshwater withdrawal)	9.16	44.59	76.25
Researchers in R&D (per million people)	994.08	2 528.04	3 822.11
Scientific and technical journal articles (per thousand capita)	23.26	93.80	121.22
Government expenditure on education, total (% of GDP)	5.4	4.6	–
Global Innovation Index	37.4	41.31	–
Renewable internal freshwater resources per capita (m^3)	1 217.09	1 410.09	2 960.96
Share of agricultural land cover (% of total land area)	71.66	49.95	42.82
Terrestrial protected areas (% of total land area)	3.99	39.65	25.94
Employment in agriculture (% of total employment)	15.25	10.05	4.10

Source: World Bank, Eurostat database.

programs, unfortunately, have not yet been adopted at the state level, which, given its orientation towards the EU, is a major drawback. First and foremost, in this regard, it is necessary to have a scientific background for such programs. The authors of this article are developing the Concept of the State Strategy for the Development of Bioeconomy in Ukraine.

As the main objectives of the Concept, the authors classify the following: creation of industrial and innovative bioeconomy infrastructure; formation and implementation of priority innovation and investment projects in the field of bioeconomy; large-scale development of the bioeconomy in the regions of Ukraine by involving local governments in this process; ensuring the competitiveness of the applied research and development sector; creation of a unified educational space of biotechnological direction by improving modern educational programs and a system for training and retraining of personnel in the fields of bioeconomy; conservation and development of bioresource potential as a basis of the bioindustry; integration of domestic biotechnology into the global bioeconomy; improvement of the legal, economic, informational and organizational base; formation of territorial agribiotechnological clusters and technological platforms, which combine the development and production of high-tech bioproducts, contribute to the effective interaction of the bio-industry market participants; creation of an environment for stimulating the demand of organizations and households for biotechnological products by forming its positive image among consumers; introduction of biotechnology in both industrial and non-production spheres; formation of a system of 'green nature management' (Fig. 2).

To address the issues of bioeconomic development, it is necessary to take a balanced approach, as too radical innovations can lead to the decline of firms and manufacturing structures, which can create an additional burden for policymakers, while at the same time contributing to a significant increase in

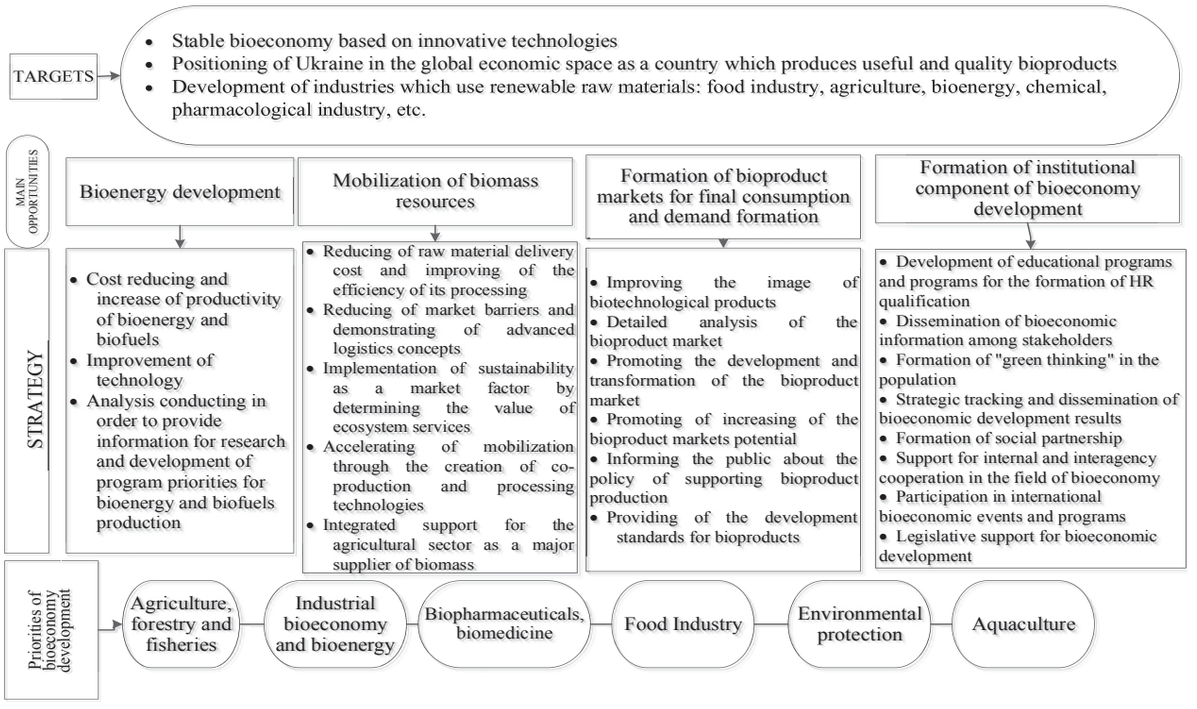

Figure 2. Designing the Policy Agenda 'Bioeconomy in Ukraine 2030' at a glance

Source: own elaboration.

labour productivity, so the scientific justification for public policy options is needed that includes consideration of primary production, healthcare, and industrial biotechnology issues, analyses cross-cutting intellectual property and technology transfer problems, assesses global challenges. Therefore, it is necessary to develop the main directions of a long-term and short-term policy of state support for the development of the bioeconomy.

Thus, in the authors' opinion, following the Policy Agenda, long-term state support for the development of bioeconomy should be directed to: (1) the development of the scientific and resource base that includes such areas as improving the personnel training system for biotechnology enterprises, as well as for conducting research works; formation of the relevant legislative field; integrated support of the agricultural sector as a major bioeconomic resource base; (2) the development of a competitive research and development sector in the field of biotechnology; narrowing the gap between research and the market; publicity and popularization of biotechnology among both producers and consumers; formation of 'green thinking'; (3) support (assistance) in the creation of agribioclusters on the territory of Ukraine, the rational use of bioresources as a basis for the creation and further development of territorial; development of alternative energy. The implementation of the measures outlined by the authors will facilitate the solution of important economic, social and environmental problems, such as increasing the production of innovative products; creating new high-tech jobs, increasing investment in the bioeconomy; formation of bioregions with the possibility of long-term economic development while preserving the natural environment, securing employment and income growth.

CONCLUSIONS

Further development of bioeconomy should be based on: the definition of the essence of bioeconomy, directions of economic and research activities related to bioeconomy, which will allow monitoring and comparative analysis of the development of bioeconomy at national and regional levels and provide information support; development and adoption of the State Strategy for the Development of Bioeconomy in Ukraine that will enable planning, coordination and communication regarding bioeconomic development processes; state regulation of strategic planning, coordination, harmonization and unification of efforts aimed at scientific research and implementation of its results in practical activities on the basis of social partnership; more specialized support for the functioning of value chains in various sectors of the bioeconomy; ensuring international cooperation on the exchange of knowledge and tools for the bioeconomic development; support and involvement of traditional sectors of the economy (for example, agriculture, trade, food, chemical industry, etc.) in bioeconomic development processes; supporting the development of interdisciplinary and specific competencies and skills in various areas of bioeconomic development; creating better conditions for financing small-scale demonstration activities and pilot facilities in the bioeconomy sector until new value chains and new technologies reach a sufficient level of profitability to be competitive in the market; taking measures to raise public awareness and perceive the benefits and threats of bioeconomic development. To reap all the benefits from the development of the bioeconomy, a purposeful government policy is needed. This will require a partnership between the government and leading companies to set goals for the use of biotechnology in primary production, processing industries, as well as in healthcare; creating the structural conditions necessary to deliver results, such as the conclusion of regional and international agreements, and developing mechanisms that will allow the policy to flexibly adapt to new realities. As a result, the impact of the bioeconomy on GDP in the future will depend on the interaction between public administration, including the level of international cooperation and the competitiveness of biotechnological innovations.

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