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## **THE DEVELOPMENT OF THE BIOECONOMY IN UKRAINE AS AN ELEMENT OF ENSURING THE SUSTAINABILITY OF DEVELOPMENT**

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In the 21<sup>st</sup> century humanity is directly confronted with a number of global environmental problems related to ecological degradation, inefficient use of energy, climate change, depletion of natural resources and others. According to the natural problems that arise as a result of the negligent attitude of human to the environment, the research of the current state of the natural environment and the development of technologies based on renewable resources become relevant. In this way, bioeconomy should ensure efficient use of natural resources and minimize the negative impact on the environment and harmonize human and nature.

Many domestic and foreign scientists were engaged in the study of development bioeconomy. Among them: Baidal, V. Butenko, V. Klymenko, O. Litvak, I. Martusenko, M. Geogkehan, G. Makedon, F. Fischler, M. Maciejczak, K. Hofreiter, and others. However, due to the lack of a bioeconomic strategy in Ukraine and the slow development of biotechnology, further research in this area becomes necessary.

The bioeconomy is a sustainable economic system based on the production of goods and services from biological resources that are continuously replenished. This economy uses biological natural resources obtained from the depths of the earth or ocean, waste from the production of food and animal feed for energy production and industrial creation of products. Agriculture, fishery, forestry, food, and biotechnology are the diverse industries that make up the bioeconomy.

In 2021, a study was conducted in Ukraine "The field of biotechnologies in the world and in Ukraine", which was conducted by the Center for Economic Strategy. According to the analyzed data, Ukraine ranks 46th, out of 156 studied countries, in terms of the number of biochemistry publications, ahead of

neighboring countries, but loses to all the countries of the European Union in terms of the share of funding, having reduced research and development costs by almost two times (from 0,75% to 0,43% of GDP) over the last ten years (The field, 2021).

According to Yevhen Groza, head of the UNDP/GEF project “Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine”, biomass has become one of the most promising renewable energy sources. In Ukraine, there is a limited use of this resource, but despite this, in 2017, biofuels and waste accounted for 80% of the total structure of energy production from renewable sources. The rate of development of bioenergy grows every year: production of biofuel and waste by 43% and the total supply of primary energy from biofuel and waste by 33%.

Ukraine's energy sector, on the contrary, depends on the import of natural resources such as natural gas, coal (50% of consumption) and oil (83% of consumption). In 2017, the cost of imported energy resources amounted to 11 billion US dollars. This indicates a high level of risk for the energy security of Ukraine and the need to apply measures regarding the extraction of energy resources in Ukraine and the development of its own bases of renewable energy sources.

Table 1. Bioenergy growth in Ukraine.

Indicator		Year			
		2015	2016	2017	2018
Production of biofuels and waste, ktoe		2606	3348	3618	3726
Absolute increase	base	-	+742	+1012	+1120
	chain	-	+742	+270	+108
Growth rate, %	base	-	+28,5	+38,8	+43
	chain	-	+28,5	+8	+3

Calculated by the author (Bioenergy, 2020)

According to a research by the Bioenergy Association of Ukraine, the share of biofuel in the total volume of primary energy supply amounted to 3.2 million tons in 2018, which is 3.4% of OPPE (Bioenergy, 2020). According to the data in table 1, it can be concluded that the production of biofuel and waste increased between 2015 and 2018. The largest chain absolute increase was observed in 2016 and amounted to 742 ktoe. Production rates began to decline significantly in 2017 and 2018, which indicates a gradual decline in the development of the bioeconomy in Ukraine.

To date, the bioeconomic strategy in Ukraine has not been formed yet, and the application of biotechnology is sporadic. The main industries where biotechnologies are used include pharmaceuticals, food industry, bioenergy and agriculture.

Despite the rather slow development of the bioeconomy, Ukraine has significant potential for the development of the biological sphere. Ukraine has large areas of fertile land, a favorable climate for livestock and crop production, and the necessary human resources. Also, the high level of productivity of Ukrainian chernozem provides a stable resource base necessary for further use and processing of the material.

The biggest barriers to the development of biotechnology in Ukraine are bureaucracy, regulatory obstacles, and the slow functioning of the permit system.

The development of the bioeconomy, primarily the introduction of new technologies and their use by society, requires mandatory support from the state. State regulation should be implemented through financial and technical support. The mechanism of state regulation can be provided by the following stages:

1. determination of specific objects that require regulation and setting goals that must be implemented through the regulation process.

2. formation of optimal methods of influence on objects of regulation.

3. analysis of regulatory tools that determine the impact on the elements of the regulatory object and their interrelationships

4. determination of necessary resources for implementation of regulation (Butenko, 2018).

In order to further develop the bioeconomy in Ukraine, it is recommended to:

- create favorable conditions for the domestic economy based on biological methods;

- develop and implement the Bioeconomy Development Strategy in Ukraine;

- carry out training and retraining of human resources in the field of biotechnology and bioeconomics;

- create a system of measures to ensure rapid promotion of biotechnological products on the market;

- create a system of measures to stimulate enterprises to use the latest technologies based on the use of renewable resources;

- develop international cooperation regarding the exchange of knowledge and technologies in the field of bioeconomy.

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