

## FORMATION OF THE DEVELOPMENT STRATEGY FOR THE BIOECONOMY IN UKRAINE

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### ABSTRACT

The article examines the role of the bioeconomy in the formation of priorities for the economic development of Ukraine. It is determined that the primary goal of the bioeconomy is the optimal use of renewable biological resources and the creation of sustainable manufacturing systems for new products. It is noted that Ukraine belongs to the countries with high bioeconomic potential, the source of which is the production of biomass of agricultural origin that creates favorable conditions for the development of the bioeconomy. The dynamics of biomass production potential are characterized by a stable increase in the amount of biomass available for use, and its energy capacity is analysed. Using the methodology of 'smart specialization', a model of strategy formation was developed, which defines the priorities, goals, and objectives of the bioeconomic development of Ukraine's economy.

**Key words:** bioeconomy, agriculture, biotechnologies, bioresources, strategies

**JEL code:** Q570

### INTRODUCTION

The issue of the development of the bioeconomy is one of the most relevant scientific studies of socio-economic policies throughout the world. The emergence of a bio-oriented economy is crucial for the modern agricultural sector.

For Ukraine, the implementation of bioeconomic measures remains relevant, as it helps create a more innovative, resource-efficient, and competitive economy. It involves shifting production to the rational use of natural resources, organic farming, and energy-

-saving technologies while reducing the industrial impact on the environment and improving its quality. The strategy based on the principles for utilizing renewable bioresources using modern innovative technologies aims to reach a compromise among the economy, society, and nature protection in the long run.

The purpose of the study is to determine the priorities and detect strategic directions for implementing the strategy for the bioeconomic development of Ukraine. The main task of this study is to outline the possibilities for the development of core sectors of the economy on a bioeconomic basis.

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## THEORETICAL BACKGROUND

The modern market economy is characterized by innovative methods of production and distribution of goods and services. Today it can be stated that new knowledge and innovation significantly influence the economy and society. One of the modern trends demonstrating the impact of innovation is the emergence and rapid development of bioeconomics (OECD, 2009).

In the EU strategy for development, the bioeconomy is presented as a strategic, integrative, intersectoral form of activity corresponding to an interdisciplinary approach to principles of research planning and funding. The scope of the bioeconomy refers to energy obtained from renewable sources and production processes in industries such as textiles, paper, chemical, cosmetic, and pharmaceutical (Wicki and Wicka, 2016). The concept of bioeconomy does not imply the development of new industries in the global and European economies. Its essence boils down to creating efficient systems of use of renewable biological resources based on a combination of existing sectors of primary production and processing. These systems should allow not only for the better use of what we already can produce but also for the efficient use of those resources, which we currently cannot use efficiently. It is assumed that the development of the bioeconomy in the coming years will be an important factor stimulating the growth of the European and global economy (Gołębiewski, 2016).

The bioeconomy forms the basis for modern directions in economic development. It is grounded in the widespread use of biotechnology and biologically renewable resources for production (Rogach, 2019). In 2012, the European Commission adopted the new, extended, and more sophisticated definition of bioeconomy, published in the 'Innovating for sustainable growth: A bioeconomy for Europe' strategy. That document defines a bioeconomy as 'an economy using biological resources from the land and sea as well as waste, including food wastes, as inputs to industry and energy production, it also covers the use of bio-based processes to green industries' (Łuczka, 2018).

The main goal of the bioeconomy is the optimal use of renewable biological resources, creating the fundamentals for sustainable manufacturing

and processing systems that will allow to produce food and non-food products at a lower cost, reduce a negative impact on the environment, and establish waste-free production. The main components of the bioeconomy refer to the use of renewable biomass sources (Kravchuk, Kilnitska and Tarasovich, 2018).

## MATERIALS AND METHODS

The purpose of the study is to analyse the possibilities for the implementation of the bioeconomy in Ukraine. The study was conducted using various international and national sources of information such as:

- The State Strategy for the Regional Development of Ukraine for 2021–2027;
- research devoted to the international experience in the implementation of development strategies for the bioeconomy;
- research related to the scientific, legislative, and resource base for the bioeconomy development in Ukraine;
- statistical yearbooks on agriculture in Ukraine 2018–2019;
- materials of the Bioenergy Association of Ukraine.

The following methodological approaches were used in the course of this study:

1. The system analysis method helped to study the dynamics of the energy capacity of biomass in Ukraine and analyse strategies for bioeconomy development in the G7 and the EU countries.
2. The modelling method that was used to describe a strategy for the development of the bioeconomy in Ukraine.

## RESULTS AND DISCUSSION

The main components of the bioeconomy are based on the use of renewable biomass sources for sustainable production, environmental protection, and the integration of biotechnological knowledge in different sectors of the economy. The bioeconomy establishes interrelations between industries due to technological innovations that enable the broad conversion of inputs and production waste management. As a result, the bioeconomy integrates diverse elements,

including processes, ecosystems, industries, innovations and technologies, raw materials, and finished goods to meet the consumers' growing expectations (Kravchuk, Kilnitska and Tarasovich, 2018).

The bioeconomy of agricultural systems comprises agricultural biomass and biotechnology. The source of biomass is crop production, and Ukraine is one of the countries with high bioenergy potential. According to statistics, since 2015, Ukraine has produced more than 60 million tons of grain annually, and in 2019 it exceeded 70 million tons. During the same period, the annual gross harvest of sunflowers amounted to more than 10 million tons, and in 2019 it reached over 15 million tons. The production of other crops, which are also a source of biomass, is increasing. Moreover, Ukrainian grain resources are basic bioproducts that are used as raw materials for the production of ethanol and bioethanol (State Statistics Service of Ukraine, 2019).

The life cycle of biofuels from agricultural biomass begins in the field. Therefore for the sustainable operation of bioenergy projects, it is vital to encourage agricultural producers and create appropriate conditions for the procurement and supply of specified volumes of energy raw materials (Kucher, 2019).

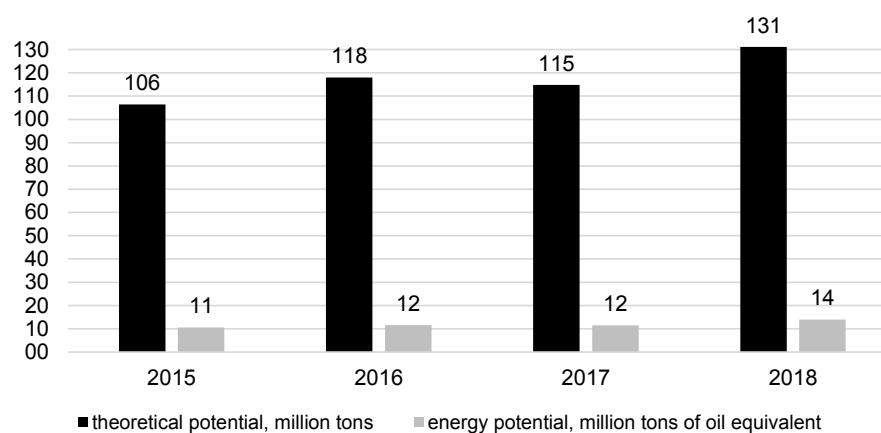
Analysis of the dynamics of growth of theoretical and energy potential of biomass and calculations (Fig. 1) showed an increase in the amount of bio-

mass available for use for bioenergy purposes from 106.4 million tons in 2015 to 131.1 million tons in 2018, which is 23.2%. The energy potential for the corresponding period increased by 3.46 million tons of oil equivalent (toe), which is equal to 32.8%. It indicates a substantial increase in opportunities to implement bioeconomic principles in the economy of Ukraine.

Various strategies for the development of the bioeconomy are utilized throughout the world. The bioeconomy strategies in the European Union (EU) are based on three pillars:

1. Investments of the EU, national and private funds in the research devoted to the bioeconomy, innovation, and skills as well as strengthening synergies with other actions.
2. Policy interaction and coordination with stakeholders through the monitoring of the bioeconomy.
3. Market development and increasing the competitiveness of the bioeconomy sectors through sustainable development of primary production; by converting waste into value-added products, and through mutual learning mechanisms (Łuczka, 2018).

An analysis of the G7 bioeconomic policy has shown that in recent years the bioeconomy has become an essential component for innovation and economic policy in developed countries. Most of them involve measures to promote technological innova-



**Figure 1.** Theoretical and energy potential of biomass in Ukraine

Source: formed by the authors based on Geletukha, Dragnev and Kucheruk (2017); Vinikaytis and Geletukha (2018); UABIO (2018), Geletukha, Zhelezna and Dragnev (2019).

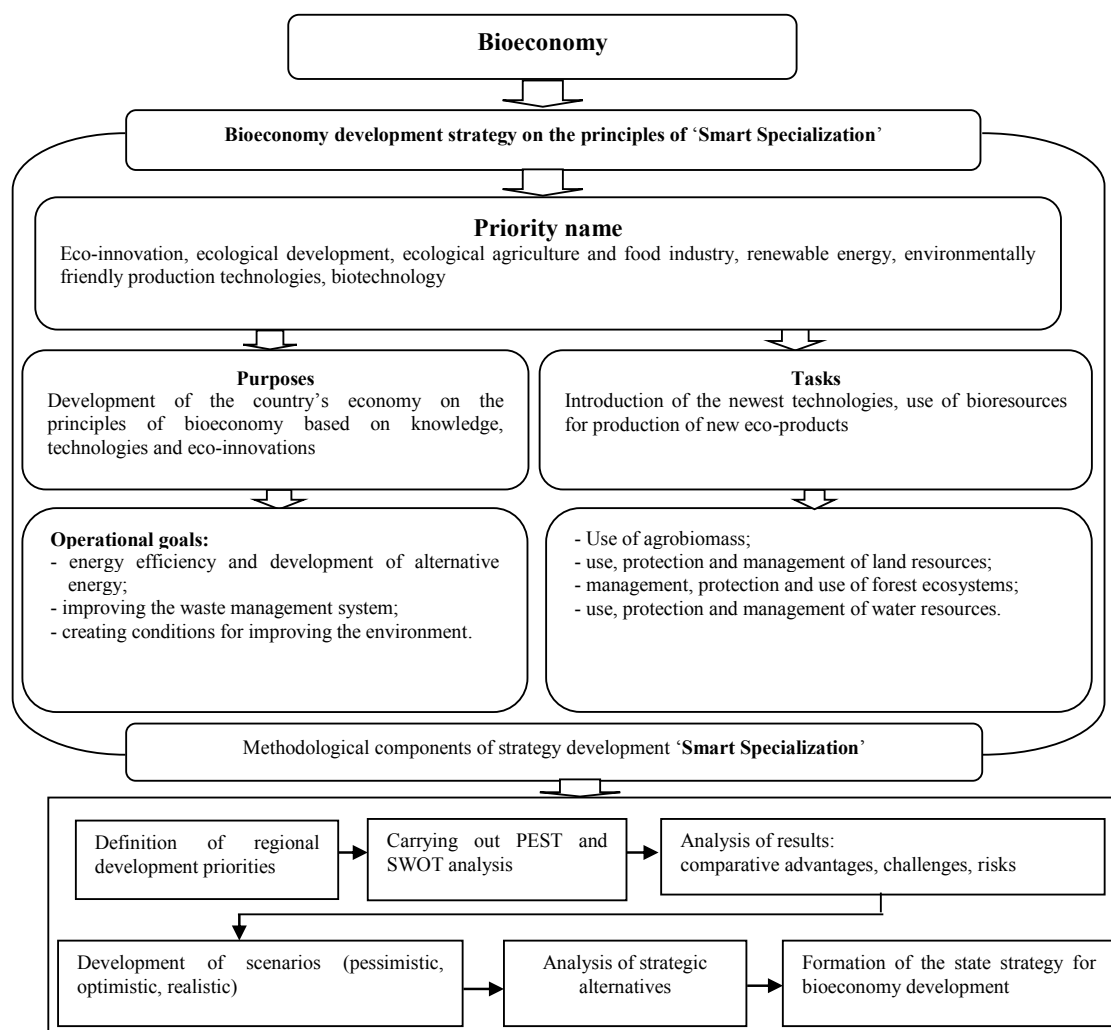
tion, economic growth, environmental sustainability, and productive efficiency.

However, the main differences in approaches to bioeconomic policy among the G7 members should be revealed. For example, the United States, Germany, and Japan have developed strategies with detailed plans to promote the use of biomass and life sciences for various purposes. Other countries, such as Italy and Canada, are pragmatic and seek to use the existing private and public research initiatives (German Bioeconomy Council, 2020). The bioeconomic strategy of Poland focuses on three areas: investment

in research and innovation, strengthening the role of government policy, bolstering markets, and the competitiveness of the bioeconomy (Gołębiewski, 2016).

The proposed model of forming the strategy of the bioeconomy development in Ukraine is aimed at creating an innovative, resource-efficient, and competitive economy that combines food security with the sustainable use of renewable energy sources and resources for industrial purposes (Fig. 2).

The model defines priorities of bioeconomic development, particularly eco-innovation, ecological development, ecological agriculture and food industry, renewable energy, environmentally friendly production technologies, biotechnology



**Figure 2.** Model of formation of the state strategy for the bioeconomy development in Ukraine

Source: developed by the authors.

environmentally friendly production technologies, biotechnology. The 'smart specialization' method was used in the development of the strategy model. Among the priorities presented in the model, Ukraine already achieved the steadily growing energy potential for renewable energy, started organic production, and thermal energy production from biomass, which is favourable for the development of the bioeconomy.

Improving the system of strategic planning of regional development is one of the main tasks of state regional policy. The methodology of regional development planning in Ukraine using the smart specialization approach is a tool for developing regional development strategies and action plans for their implementation. Smart specialization is a strategic planning approach that provides for the definition of individual goals and objectives within the regional strategy, taking into account the competitive advantages of the region for the development of economic activities that have innovative potential. These are plans developed at the regional and national levels, which determine the priorities of regional development in the field of research and innovation, as well as those sectors of the economy that may become the most promising in the future.

The main principle of the smart specialization strategy is a local approach, which means that it draws on the assets and resources available to the regions and their specific socio-economic challenges, to identify unique opportunities for development and growth. So, the smart specialization strategy integrates key aspects of life and development of regions, in particular, economic, social, environmental, and technological, supporting their continuous interaction and promoting innovation and regional development (Ministry of Communities and Territories Development of Ukraine, 2018).

The rapid development of the bioeconomy will be facilitated by the implementation of a set of measures provided by the State Strategy for Regional Development for 2021–2027, which determines the general vector of sustainable development of regions and the economy as a whole (Kabinet Ministriv Ukrainy Postanova vid 5 serpnia 2020 r. No 695). Hence, it is essential to ensure financial support, provide techni-

cal regulation, create incentives for the formation of branches of the bioeconomy, construct the necessary technological infrastructure, and revive demand for production.

## CONCLUSIONS

The European Commission's 2012 Strategy 'Innovation for Sustainable Bioeconomy for Europe' defines the bioeconomy as an economy that uses biological resources as an investment in the industry to produce food and non-food products and energy. The main components of the bioeconomy are the use of renewable biomass sources. In Ukraine, the accelerated development of the bioeconomy will be facilitated by the implementation of a set of measures envisaged by the State Strategy for Regional Development for 2021–2027, which determines the general vector of sustainable development of regions and the economy as a whole.

The results of the study indicate that the goals of the bioeconomy include the following: the optimal use of renewable biological resources and creation of sustainable production systems based on them; the assistance in re-equipment of production referring to modern, energy-efficient, resource-saving, and ecologically safe technologies; the creation of an innovative economy that combines food security with the sustainable use of renewable energy sources and resources to produce new products.

The proposed model of the development strategy for the bioeconomy will ensure the development of all regions of Ukraine in terms of the optimal use of available renewable biological resources and the application of innovative production methods that balance the interests of the economy, society, and nature protection because the basic principle of smart specialization strategy is a local approach, which means that it relies on the assets and resources available to the regions and their specific socio-economic challenges to identify unique opportunities for development and growth.

Further research should be related to the establishment of mechanisms and recommendations for the development of the bioeconomy in Ukraine.

## Acknowledgements

The research was funded partially by the Warsaw University of Life Sciences Scholarship Fund – SGGW.

## REFERENCES

1. Bioenergy Association of Ukraine (UABIO) (2018). Bioenergy transition in Ukraine. Retrieved from: <https://uabio.org/bioenergy-transition-in-ukraine>
2. Geletukha, G., Dragnev, S., Kucheruk, P. (2017). Praktychnyy posibnyk z vykorystannya biomasy v yakosti palyva u munitsypalnomu sektori Ukrayiny (dlya predstavnykiv ahropromyslovoho kompleksu) [Practical guide to the use of biomass as a fuel in the municipal sector of Ukraine (for representatives in the agro-industrial association)] [in Ukrainian]. Retrieved from: <https://saf.org.ua/wp-content/uploads/2017/12/Praktychnyj-posibnyk-dlya-predstavnykiv-agropromyslovogo-kompleksu-UNDP-2017-UA.pdf>
3. Geletukha, G., Zhelezna, T., Dragnev, S. (2019). Analiz bayeriv dlya vyrobnytstva enerhiyi z ahrobiomasy v Ukrayini [Analysis of barriers to energy production from agrobiomass in Ukraine]. *Analitichna zapyska BAU*, 21 [in Ukrainian]. Retrieved from: <https://saf.org.ua/wp-content/uploads/2019/04/position-paper-uabio-21-ua.pdf>
4. German Bioeconomy Council (2020). Bioeconomy Policy – Synopsis and Analysis of Strategies in the G7 (report). Retrieved from: [https://bioekonomierat.de/fileadmin/Publikationen/berichte/BOER\\_Laenderstudie\\_1\\_.pdf](https://bioekonomierat.de/fileadmin/Publikationen/berichte/BOER_Laenderstudie_1_.pdf)
5. Gołębiewski, J. (2016). Condition and potential for development of the biomass market. *Naukovyy visnyk NUBiP Ukrayiny. Ekonomika, ahraryny menedzhment, biznes*, 244, pp. 53-63. Retrieved from: <http://journals.nubip.edu.ua/index.php/Economica/article/view/7322/7082>
6. Kabinet Ministriv Ukrayiny Postanova vid 5 serpnya 2020 r. No 695. Pro zatverdzhennya Derzhavnoyi stratehiyi rehionalnoho rozvytku na 2021-2027 roky [Resolution of the Cabinet of Ministers of Ukraine of 5 August 2020 No 695. On the approval of the State Strategy for Regional Development for 2021-2027] [in Ukrainian]. Retrieved from: <https://zakon.rada.gov.ua/laws/show/695-2020-%D0%BF#Text>
7. Kravchuk, N., Kilnitska, O., Tarasovich, L. (2018). Bioekonomika: henezys i suchasni imperatyvy [Bioeconomics: Genesis and Modern Imperatives. Economics, economic theory]. *Biznes inform*, 2, pp. 8-18 [in Ukrainian]. Retrieved from: [http://nbul.gov.ua/UJRN/binf\\_2018\\_2\\_2](http://nbul.gov.ua/UJRN/binf_2018_2_2)
8. Kucher, O. (2020). Economic aspects of biomass market development in Ukraine. In: 6<sup>th</sup> International Conference – Renewable Energy Sources (ICoRES 2019). <https://doi.org/10.1051/e3sconf/202015401007>
9. Łuczka, W. (2018). Green economy and bioeconomy concepts in the context of sustainable development. *Ekonomia i Środowisko*, 4, pp. 8-22. Retrieved from: <http://www.ekonomiaisrodowisko.pl/uploads/eis67.pdf>
10. Ministry of Communities and Territories Development of Ukraine (2018). Metodolohiya planuvannya rehionalnoho rozvytku v Ukrayini Instrument dlya rozrobky stratehiy rehionalnoho rozvytku i planiv zakhodiv z yikh realizatsiyi (iz zastosuvannyam pidkhotu smart-spetsializatsiyi) [Methodology of regional development planning in Ukraine (using the smart specialization approach)] [in Ukrainian]. Retrieved from: [https://cg.gov.ua/web\\_docs/1/2014/11/docs/Methodology\\_of\\_RD\\_planning.pdf](https://cg.gov.ua/web_docs/1/2014/11/docs/Methodology_of_RD_planning.pdf)
11. Organisation for Economic Co-operation and Development (OECD) (2009). The Bioeconomy to 2030. Designing a policy agenda Main Findings and Policy Conclusions. OECD International Futures Project, Paris. Retrieved from: <https://www.oecd.org/futures/long-termtechnologicalsocietalchallenges/42837897.pdf>
12. Rogach, S. (2019). European experience of agricultural sector development on bioeconomic principles. *Priazovsky Economic Bulletin*, 4 (15), pp. 208-215. <https://doi.org/10.32840/2522-4263/2019-4-35>
13. State Statistics Service of Ukraine (2019). Silske hospodarstvo Ukrayiny 2018. Statystychnyy zbirnyk [Agriculture of Ukraine 2018. Statistical Yearbook] [in Ukrainian/English]. Kyiv. Retrieved from: [http://www.ukrstat.gov.ua/druk/publicat/kat\\_u/2019/zb/09/Zb\\_sg\\_2018%20.pdf](http://www.ukrstat.gov.ua/druk/publicat/kat_u/2019/zb/09/Zb_sg_2018%20.pdf)
14. State Statistics Service of Ukraine (2020). Sotsialno-ekonomichne stanovyshche Ukrayiny za 2019 rik [On the socio-economic situation of Ukraine in 2019] [in Ukrainian]. Retrieved from: <https://ukurier.gov.ua/uk/articles/socialno-ekonomichne-stanovishe-ukrayini-za-2019-r>
15. Vinikaytis, G., Geletukha, G. (2018). Perspektyvy rozvytku rynku biomasy v yes i Ukrayini. Vplyv vykorystannya biomasy na zminu klimatu [Prospects for the development of the biomass market in the EU and Ukraine the impact of biomass use on climate change] [in Ukrainian]. Retrieved from: <https://uspp.ua/assets/doc/uspp-biomass.pdf>
16. Wicki, L., Wicka, A. (2016). Bioeconomy sector in Poland and its importance in the economy. In: Proceedings of the 2016 International Conference 'Economic science for rural development', Jelgava, LLU ESAF, 41, pp. 219-228. Retrieved from: [https://lufb.llu.lv/conference/economic\\_science\\_rural/2016/Latvia\\_ESRD\\_41\\_2016-219-228.pdf](https://lufb.llu.lv/conference/economic_science_rural/2016/Latvia_ESRD_41_2016-219-228.pdf)