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PROSPECTS OF INTERSTATE COOPERATION: SOUTH KOREAN AND UKRAINIAN BIOINDUSTRY

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One of the fastest-growing and most promising sectors of the modern economy is the bioindustry, which is rapidly advancing in leading countries through investments in science, innovation, and green technologies. It plays a crucial role in promoting sustainable development by decreasing reliance on fossil fuels, preserving the environment, and generating new high-tech jobs, thereby strengthening economic resilience and boosting global competitiveness.

The South Korean bioindustry is characterized by a high level of government support, active involvement of the private sector, rapid adoption of biotechnological innovations in pharmaceuticals, agriculture, and healthcare, as well as a strong commitment to strengthening its position in the global market through strategic partnerships and the development of export potential. A central force in guiding its trends and progress is the Korea Biotechnology Industry Organization (KoreaBIO, kor. *한국바이오협회*), founded in 2008 to foster technological innovation and support industrial development [1]. At the same time, a similar role in Ukraine is likely to be taken on by the Biotechnology and Bioengineering Association of Ukraine (ABBU, ukr. *Асоціація біотехнології та біоінженерії України*), the establishment of which was marked by its First Congress in 2024 [2].

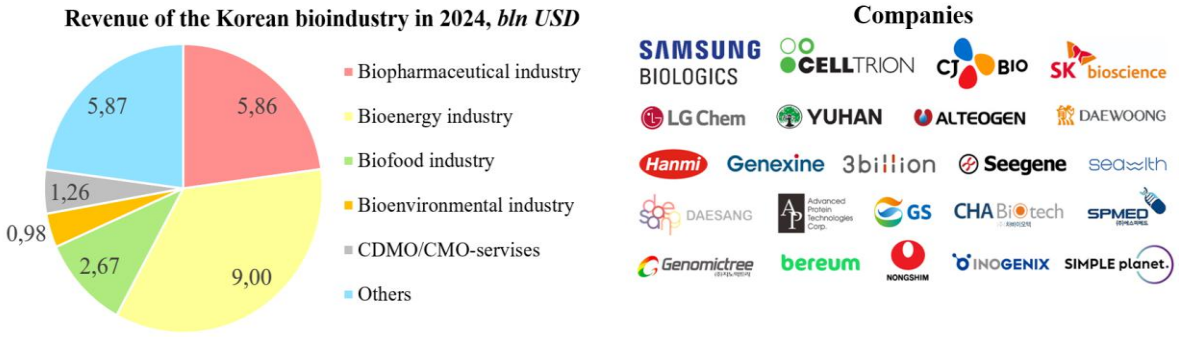
Fig. 1. **Logos of Korea Biotechnology Industry Organization and Biotechnology and Bioengineering Association of Ukraine**

According to KS J 1009: Classification of the Bioindustry, established by the Korean Agency for Technology and Standards, key strategic sectors include the biopharmaceutical, bioenergy, biofood, and bioservice industries [3–5]. Harmonizing standards with international frameworks, including Korean standards, will promote cooperation between Ukrainian and Korean producers of bioproducts and bioservices, and support the development of new technologies. To outline promising areas of cooperation the following trends in the Korean bioindustry (fig. 2) have been identified by the authors:

· a high interest in biopharmaceutical developments and appropriate investment policy of foreign companies (e.g., cooperation of Alteogen Inc and AstraZeneca Plc, OliX Pharmaceuticals Inc and Eli Lilly & Co etc.) [6];

· government support for the development of the hydrogen economy by 2030 ("Hydrogen Act", set in 2021) [7];

· ensuring food security by using of biotechnology, including the development of the the cultured meat market (e.g., the Gyeongbuk Cell-Cultured Foods Regulatory-Free Special Zone project) [8];



** Analised, developed and compilated by authors based on [9–16; 1, 17].*

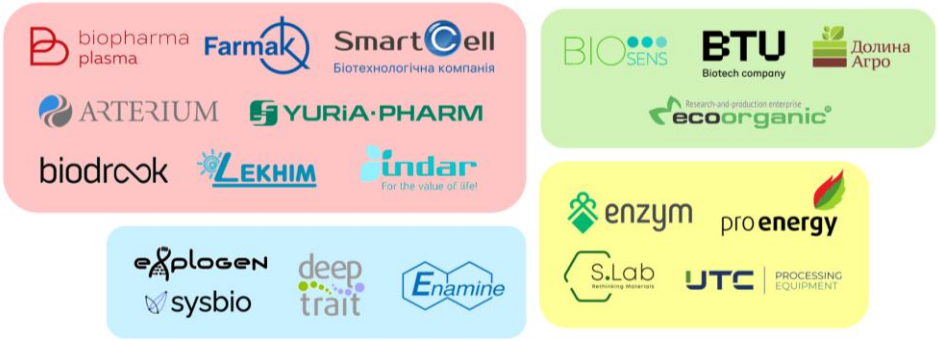
Fig. 2. **Revenue of the key industries in Korean bioindustry and logos of companies**

· developing innovations in the bioenvironmental industry, especially in the field of vertical farming [13–15, 18];

· provision of CRO-/CMO-/CDMO-services for companies all over the world, which is based on a solid scientific foundation and industrial and technical capabilities [19–21].

The Biotech Sectoral Strategy of Ukraine 2030 [22], developed by the Ministry of Digital Transformation of Ukraine and the Ministry of Education and Science of Ukraine, considers the bioeconomy as one of the key areas and seeks to apply modern biotechnology to tackle environmental challenges, enhance public

health, and foster the growth of emerging industries. The focus is on healthcare, bioinformatics (incl. CRO-/CMO-/CDMO-services), agriculture and industrial processing (incl. bioenergy sector, biochemistry, and bioremediation). Special attention will be paid to the formation of bioclusters that serve as an environment for the unification of R&D institutions, financial institutions (state, private investment funds), technology developers and end users of technologies.



** Analised, developed and compilated by authors based on [22–25].*

Fig. 3. **Logos of main Ukrainian biotech companies**

Therefore, among the common patterns of the Korean and Ukrainian bioindustry, we can highlight development of biopharmaceuticals, advancement of bioenergy and the agro-industrial sector, as well as the implementation of high-tech innovations in science and production. International cooperation is a key to economic growth and development, as well as to solving medical and pharmaceutical, food, energy and environmental problems of humanity. As of 2025, there are several examples of Korean-Ukrainian cooperation within the bioindustry.

In 2023, officials from Ukraine's Ministry of Energy and South Korea's Ministry of Land, Infrastructure and Transport reaffirmed their shared interest in expanding cooperation in hydropower, the nuclear sector, and renewable energy [26]. Building on this, a framework intergovernmental agreement was signed in 2024, under which Ukraine will receive USD 2.1 billion in concessional loans from Korea's Economic Development Cooperation Fund (EDCF). A key focus for future collaboration between Ukrainian and Korean businesses is green metallurgy and the development of modern energy infrastructure. Posco International is set to play a significant role in Ukraine's reconstruction, with one of its first projects being the construction of a cogeneration power plant in Odesa using refuse-derived fuel (RDF). If favorable conditions persist, the agreement is expected to expand to include more private sector involvement, additional projects, and greater investment volumes [27].

During the visit of the President of Korea to Ukraine, the introduction of smart farming and organic farming into agribusiness was discussed, as well as the development of environmentally friendly technologies for the construction of a modern city and its infrastructure.

South Korean companies have expressed interest in contributing to smart city and infrastructure development projects in Ukraine. One potential initiative involves transforming Trukhaniv Island in Kyiv into an eco-friendly innovation park featuring research laboratories and residential spaces. However, at this stage, the project remains a conceptual proposal [28–30].

Other promising areas, according to the authors, include:

- biological wastewater treatment and bioremediation, which will reduce and eliminate the consequences of a full-scale Russian invasion of Ukraine;
- vertical farming to minimize the required land area, which is especially relevant in conditions of destroyed infrastructure;
- production of biodegradable and bio-based polymers from natural resources;
- creation of energy-efficient ecological buildings using bioinsulation materials;
- inter-institutional cooperation for the development of innovative bioproducts and for the exchange of knowledge and experience.

Conclusions. Interstate cooperation between South Korea and Ukraine in the field of bioindustry holds significant potential, especially in biopharmaceuticals, green technologies, and innovation infrastructure. The Korean model, with its strong public-private partnerships and advanced regulatory framework, offers valuable insights for the development of Ukraine's bioeconomy. These aspects are explored in greater detail in the analytical review manuscripts submitted to the Ukrainian journal *Biotechnologia acta*.

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